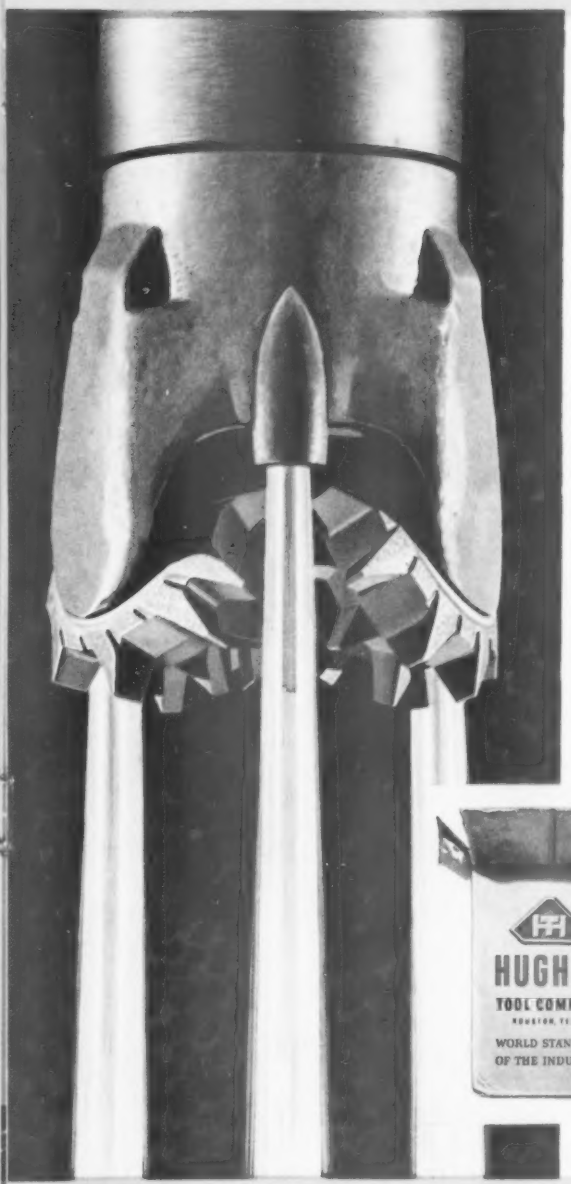
DRILLING CONTRACTORS' NUMBER

the OIL AND GAS JOURNAL



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JET ROCK BITS

Hughes Jets are field-proven... and the product of several years of concentrated research. Their development started in 1948 in co-operation with the drilling industry.

Thousands of Hughes Jet Bits have been run under the close supervision of Hughes research and development engineers... and in virtually every active drilling area. Their penetration rate and footage per bit have been phenomenal in formations of low to medium compressive strength.

Hughes' high velocity jet rock bits provide:

1. Recognized cutting efficiency of Hughes Tri-Cone and Two-Cone Bits.
2. Flow pattern that assures instant lifting of cuttings off bottom, permitting the bit teeth to act on virgin formation at all times.
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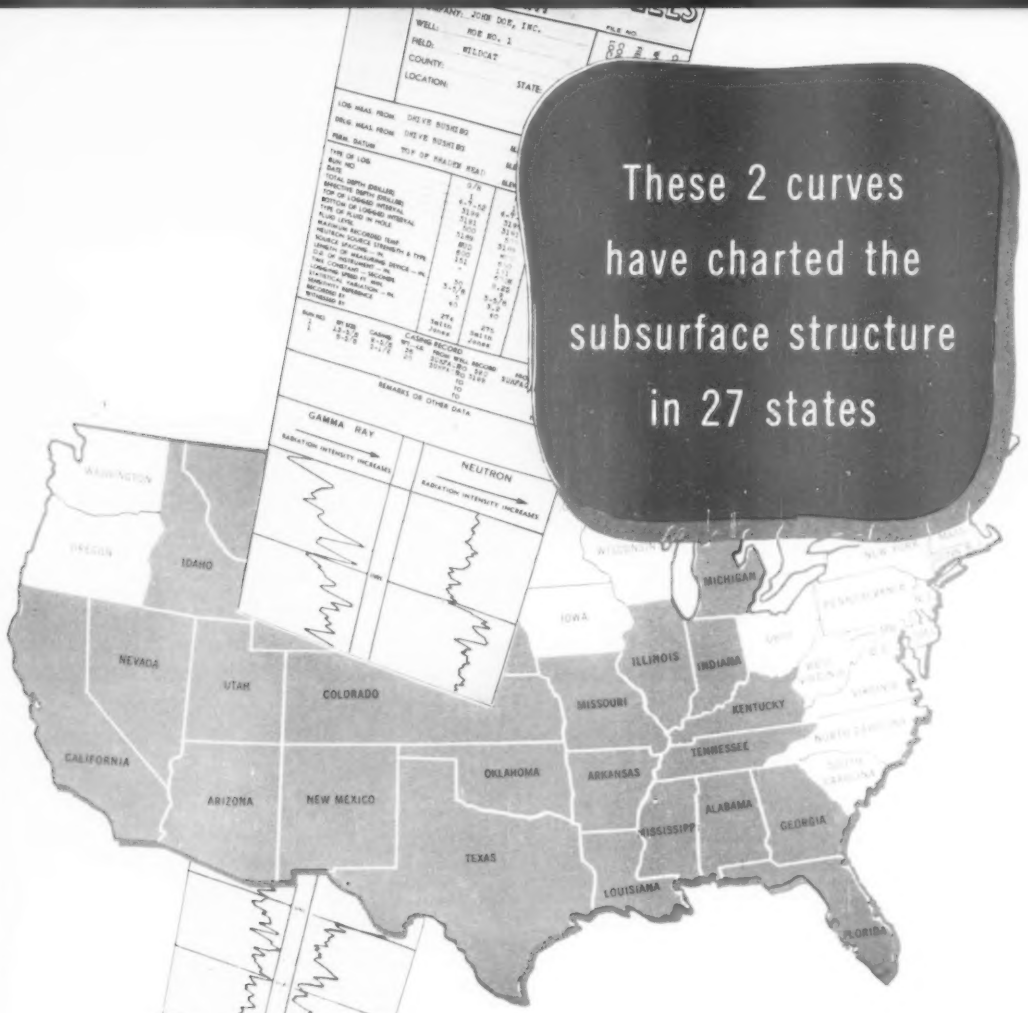
4. Erosion-resistant nozzles positioned to direct high velocity streams on bottom.

You get the benefit of 43 years' experience in building the industry's finest bits when you run a HUGHES Jet Rock Bit.

Information concerning "Hydraulics in Jet Bit Drilling" is available through your local Hughes representative.

PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 **SEPTEMBER 29, 1952**



★ From Alabama to Arizona, Michigan to Montana, and all the oil country in between, the gamma ray and neutron instruments of Lane-Wells Radioactivity Well Logging have written the records of oil field structure in more than 3,200 fields and 3,000 wildcats.

Because Lane-Wells *knows* the oil country from crown block to well bottom, because Lane-Wells provides quick service from 71 locations, many shrewd operators rely on Lane-Wells Radioactivity Well Logging to provide them with reliable, complete down-hole information as a guide to the best possible completions.

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THE OIL AND GAS
JOURNAL
Vol. 51, No. 21

CONTENTS FOR SEPTEMBER 29, 1952

NEXT WEEK

- A symposium on jet fuels. . . specifications, manufacture, and current and future usage. Demand for these fuels is increasing, and in the event of war United States refineries will be called for all-out production. Articles cover the role of the small refiner in the jet-fuel program, how existing processing equipment can be adapted to produce this material, military requirements, use of jet fuel by civil aircraft, and specifications for these fuels.
- Production of Ammonium Sulfate From Refinery Waste.
- Exploration in Nova Scotia.
- Vapor-Phase Cooling Used in Pumping Wells in Wilmington Field.

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Often the MOST ECONOMICAL and EFFICIENT WAY to Transfer and Mix Fluids

The jet pump is a simple device which uses steam, water or air under pressure to pump (or mix) fluids that can include solids in suspension. Jet pumps have no moving parts, need no lubrication, have no packing glands, are practically noiseless. They are low in initial cost and installation cost . . . compact in size and trouble-free. Penberthy offers a variety of jet pumps for a wide range of ordinary and unusual applications. They can be made from materials that withstand corrosion, contamination and high temperatures. Ask for new Bulletin 512.

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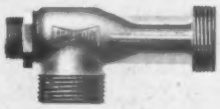
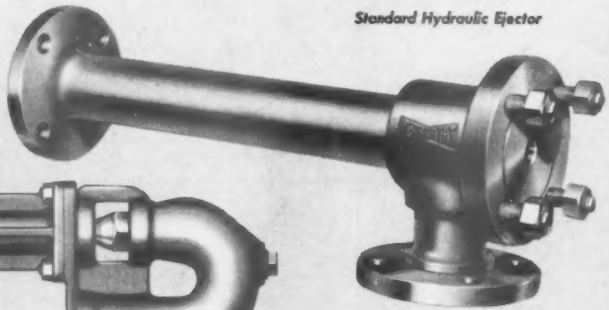
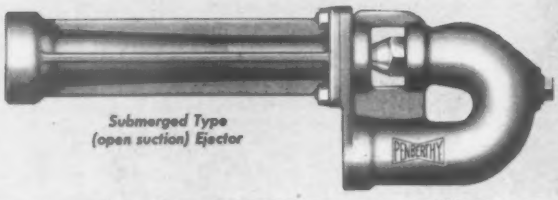


Standard Hydraulic Ejector

Stainless Steel Jet Pump for Handling Corrosive Chemicals

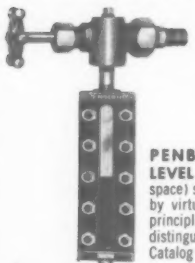




Submerged Type (open suction) Ejector

WRITE FOR *New* BULLETIN No. 512

OTHER PENBERTHY PRODUCTS



PENBERTHY TRANSPARENT LIQUID LEVEL GAGE—Used to observe color and density of liquids under high pressures and/or temperatures. Exceptionally sturdy construction—liquid chamber machined from solid block of metal. Ask for Catalog 35.

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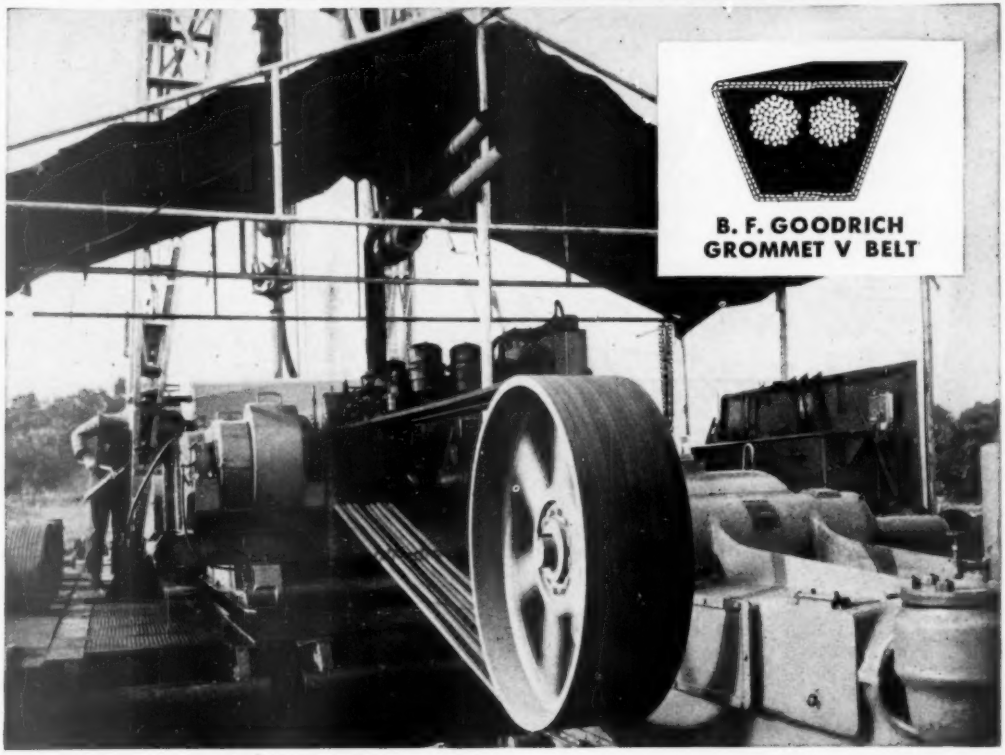

These B.F.Goodrich grommet belts now on 24th oil well

Grommet V belts last longer, serve better, save money

THESE B. F. Goodrich grommet V belts run the mud pump on an Oklahoma oil drilling rig. When the picture was taken, they'd been in continuous service for 14 months. And this job was their 23rd well, representing a total of 15 miles of drilling. In spite of the continuous high speed operation and exposure to all kinds of weather, these B. F. Goodrich belts showed very little wear, were moved to their 24th well. Here's why grommet V belts can cut costs 20 to 50%:

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a BFG grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet belts stretch less — only ⅓ as much, on an average, as ordinary V belts.

Better grip, less slip — Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Only B. F. Goodrich makes the grommet belt — (U. S. Patent No. 2,233,294). Available in C, D and E sections. Next time you need V belts, ask your local supply house for a set of grommet belts, or order direct from the nearest B. F. Goodrich warehouse — located in Dallas, Houston, Odessa, Oklahoma City, and Tulsa. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet V-Belts BY
B.F.Goodrich
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For MEDIUM-DEEP drilling . . . an "Oilwell" No. 76 Rig with companion "Oilwell" equipment including No. 218-P Pumps can be depended upon to give you equally satisfactory performance to depths of 10,000 feet.

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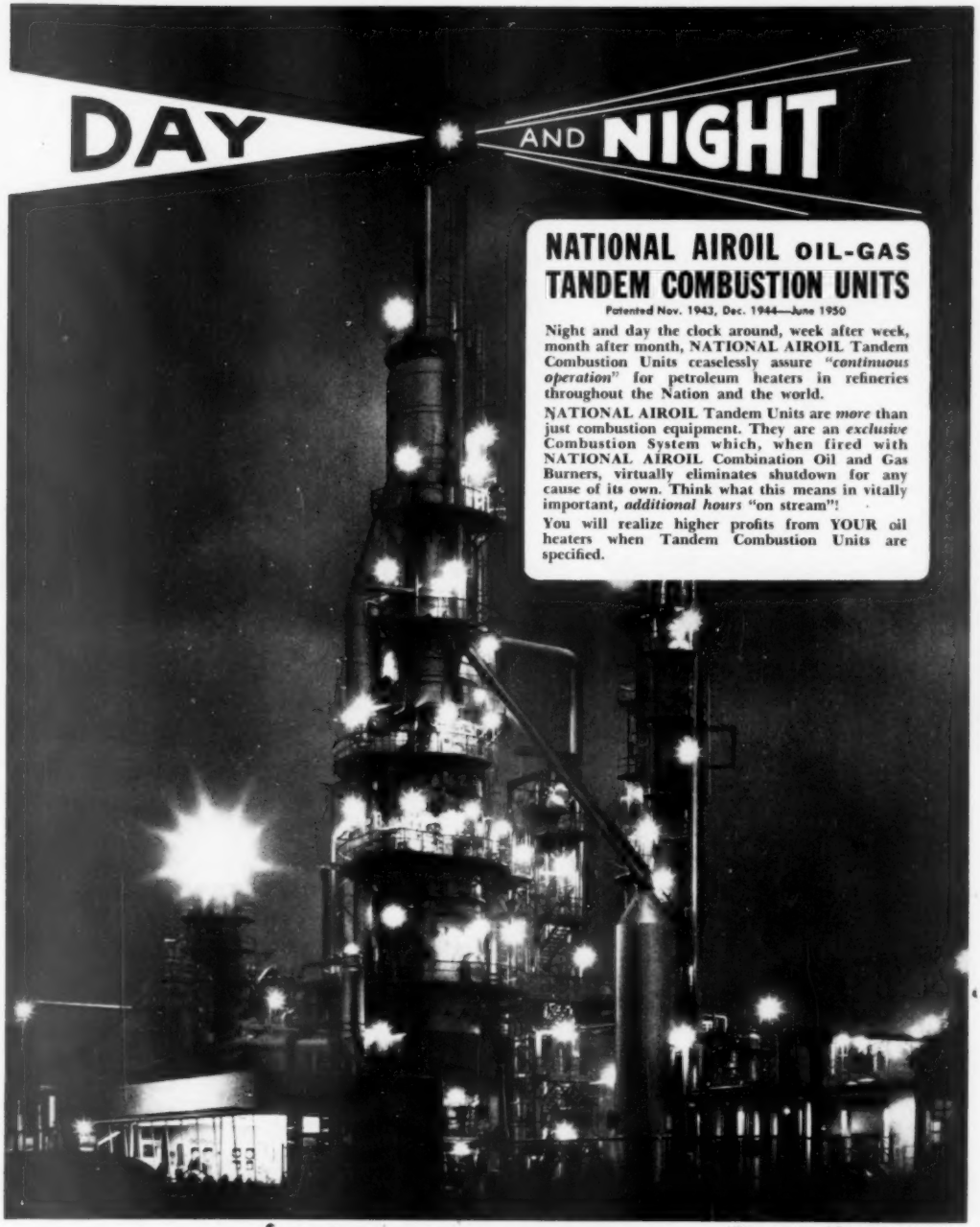

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Patented Nov. 1943, Dec. 1944—June 1950

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NATIONAL AIROIL Tandem Units are *more* than just combustion equipment. They are an *exclusive* Combustion System which, when fired with NATIONAL AIROIL Combination Oil and Gas Burners, virtually eliminates shutdown for any cause of its own. Think what this means in vitally important, *additional hours* "on stream"!

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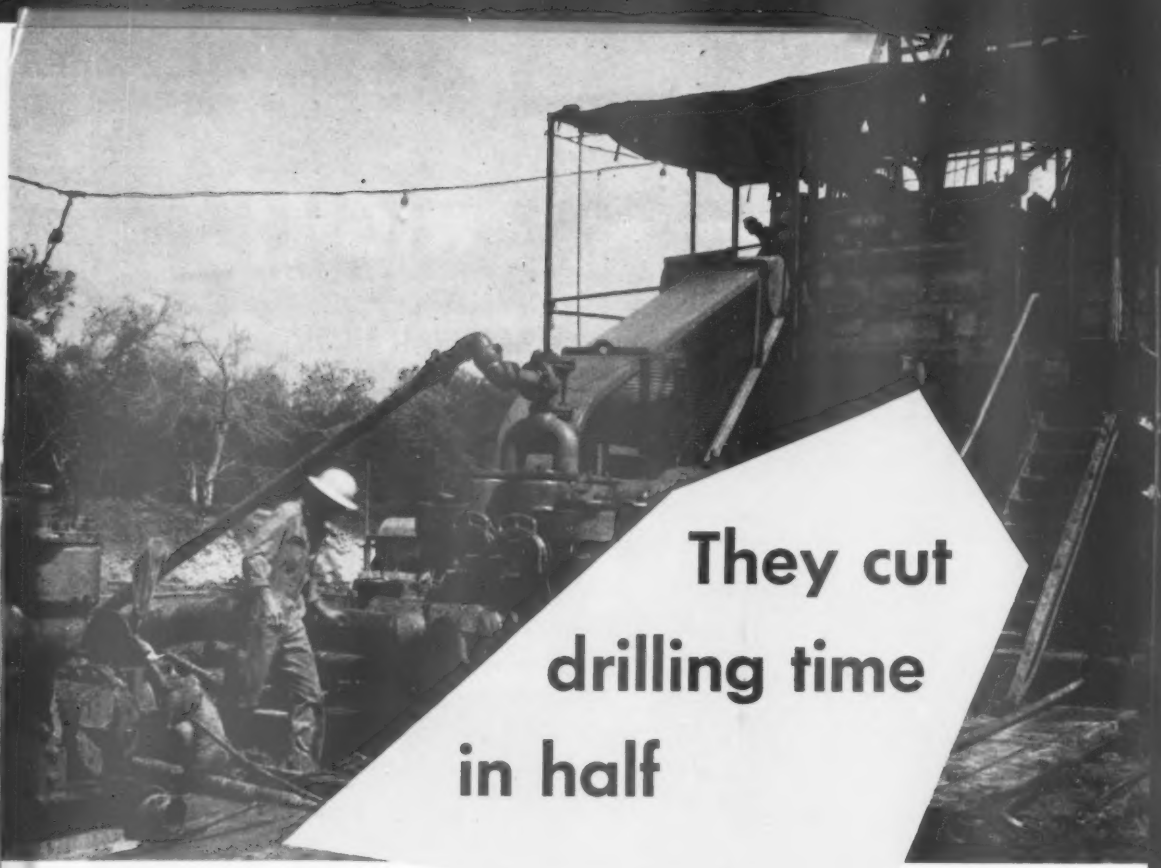

They cut drilling time in half

Newman Brothers Drilling Company, San Antonio, Texas, had good reason for investing in these two big "Caterpillar" Oilfield Engines. Let's hear about it from William C. and John E., in their own words: "When 'Cat' writes its name on an engine, you can bet it's the best. We know. Before we got our D386s, we had two D13000s working constantly for us since 1940 – about 12 years. We'd refer to the power they deliver as 'dray' horsepower – not 'little colt' horsepower. We've had no trouble with our D386s since we bought them. They're great!"

The two D386s are compounded to drive a Gardner-Denver mud pump and Brewster draw works on an oil lease in McMullen County, 150 miles south of San Antonio. According to Newman's tool pusher on the job, they're drilling between 7,000 and 10,000 foot holes in just half the time formerly averaged with engines of another make. The two "Cat" D13000s, incidentally, were rebuilt after more than 40,000 hours of service, and are now back on their rig.

Performance like this is typical of "Caterpillar" Oilfield Engines. They're built for long life with a minimum of down-time – and they're true to their rating. They deliver the horsepower as advertised. For fast round trips, you can count on "Cat" Diesels to come through with all the power promised!

Compact oilfield engines are available in 12 honestly rated sizes, to 500 HP. Ask your reliable "Caterpillar" Dealer about their performance in the field. He's nearby, with genuine parts and complete service facilities at your disposal!

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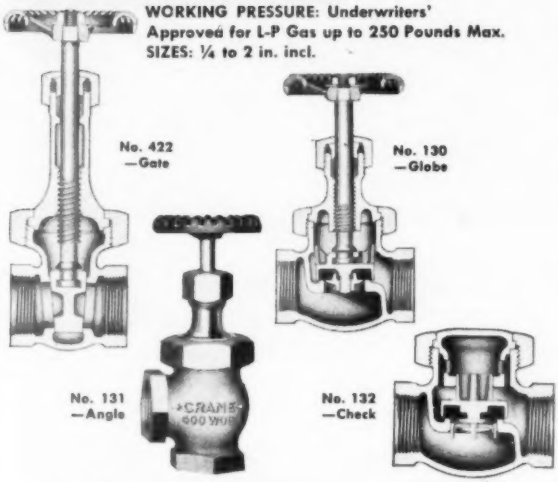

WORKING PRESSURE: Underwriters' Approved for L-P Gas up to 250 Pounds Max.
SIZES: ¼ to 2 in. incl.

Globe and Angle Valves have composition disc with easy-to-change slip-on disc connection.

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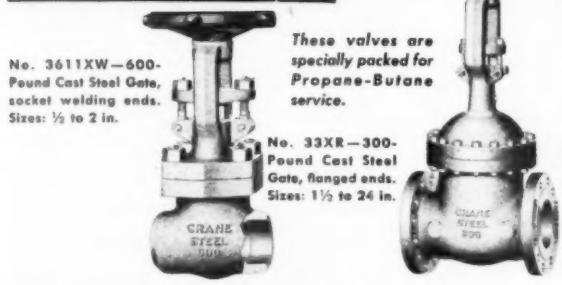

No. 3611XW—600-Pound Cast Steel Gate, socket welding ends. Sizes: ½ to 2 in.

These valves are specially packed for Propane-Butane service.

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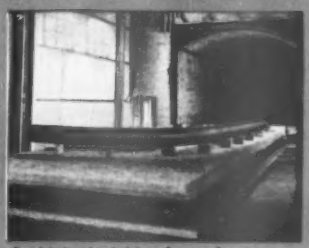
Manufacture of this main steam piping began at Pennsylvania Forge Corporation as 20-ton alloy-steel ingots (2½% chrome, 1% moly steel). Four days' forging changed the ingots into solid bars 30 ft. long, with outside diameter of 15½ in. Boring, turning, sizing and finishing followed.

FABRICATION of the main steam line for the Salem Harbor Station of the New England Power Company, vital link in more than 52 miles of piping fabricated by Grinnell, is an example of the *many* skills required of Grinnell piping specialists. Grinnell chemists, metallurgists, physicists and radiologists . . . *all* played a part in the bending, welding and testing operations.

The integration of complex, highly technical skills like these into a *single* organization of trained specialists explains Grinnell's leadership in the field of prefabrication. It explains, too, why your interests are best served when you call upon Grinnell's expert personnel and specialized facilities in the solution of your piping problems.

Bending furnace raises pipe temperature to 2000°F in 3 hours, 40 minutes. Thermocouples and pyrometer measure pipe temperature.

Skilled team completes bend in six minutes. Inside surface temperature dropped about 100°F.



Bend being loaded into furnace for stress relieving. Heat maintained at 1425°F for 4½ hours, then gradually reduced.

Ultrasonic inspection of wall after cleaning of pipe shows maximum thinning in bend of 1/16 inch.

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WHENEVER PIPING IS INVOLVED

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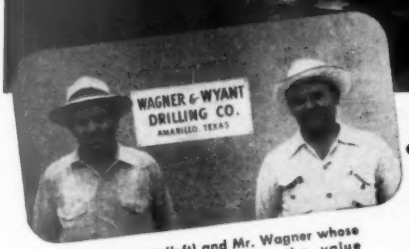
MORE MURPHY DIESEL POWER FOR WAGNER AND WYANT



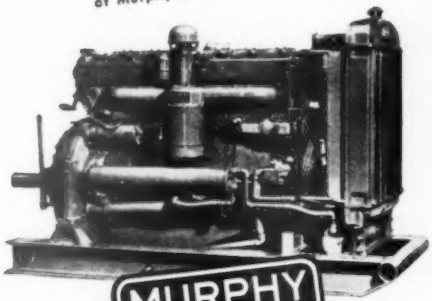
Mr. Wyant (left) and Mr. Wagner whose experience has proved the value of Murphy Diesels in the oil fields.

...REPEAT ORDERS ARE THE BEST PROOF OF OWNER SATISFACTION

The recent installation of a Murphy Diesel Model 122 to drive the mud pump of Wagner and Wyant's Rig No. 3 runs to 7 the number of Murphys which have been owned by this outfit. The new engine which is rated at 190 H.P., continuous and 210 H.P., intermittent powers a D-175 Emsco pump.

Repeat orders like this are the best proof of satisfactory engine service . . . and that's why we're proud of the fact that so many of the new Murphy Diesels going into the oil fields are going to people who have used Murphys before.

It will pay you to find out what Murphy can do for you. Call your Murphy Diesel Dealer, today.



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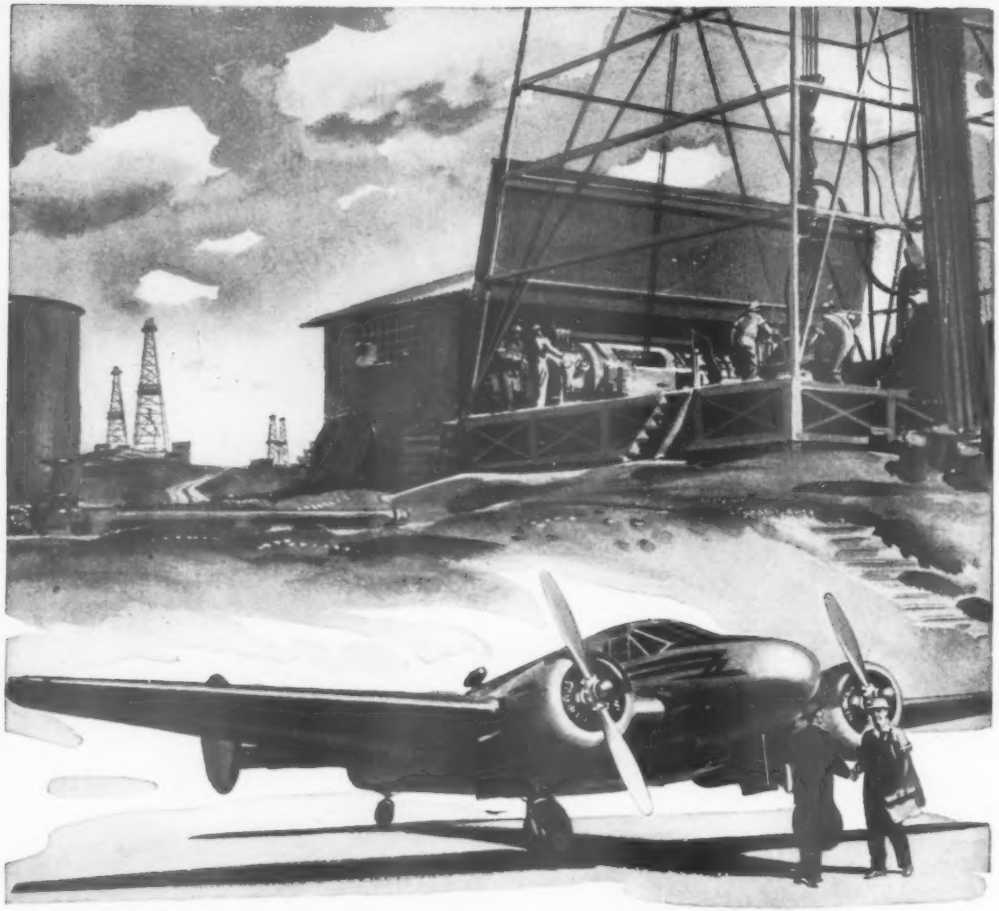

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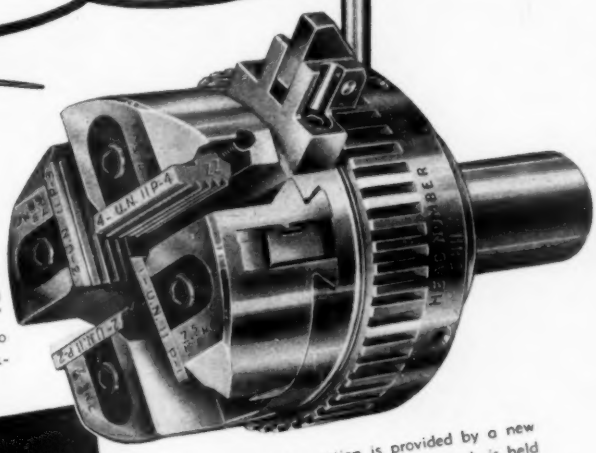
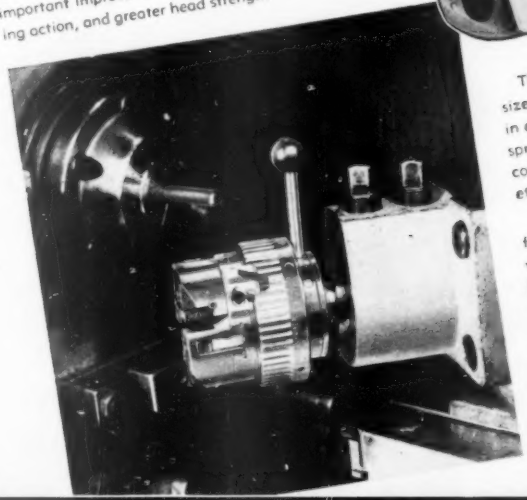


- **POSITIVE LOCKING ACTION**
- **MORE RIGID CONSTRUCTION**

An improved **LANDMATIC** Hardened and Ground threading head has been designed for use on turret lathes, hand-operated screw machines, and automatic screw machines employing a stationary head. The 5HH **LANDMATIC** is a stationary self-opening head, and will produce threads ranging from 1/4" to 5/8" in diameter. Its construction features two important improvements in design—a positive locking action, and greater head strength.



The positive locking action is provided by a new size-adjustment mechanism. A pivoted latch is held in engagement with notches on the adjustment ring by spring tension. A movement of one notch makes a corresponding adjustment of .001" on the pitch diameter of the workpiece.

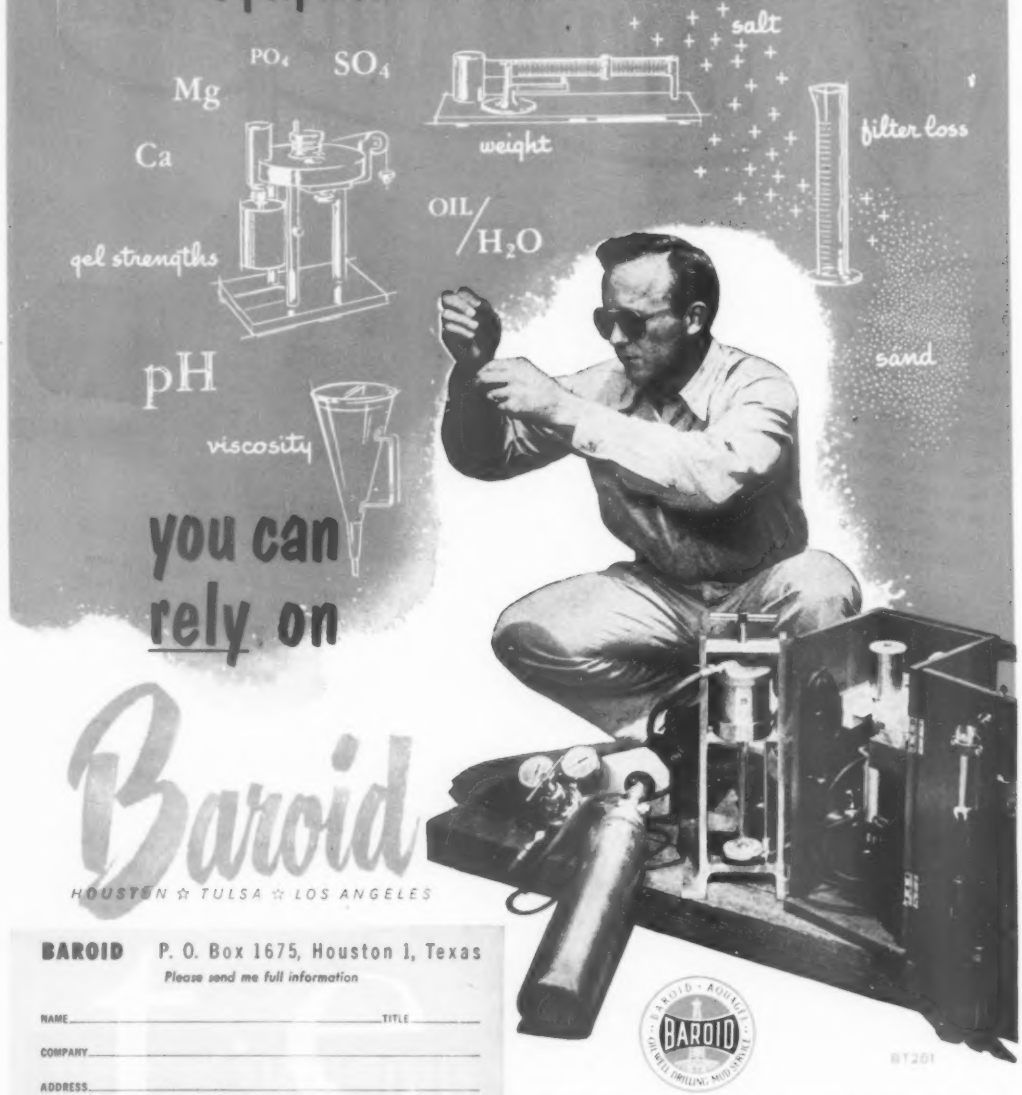
The greater overall strength of this die head results from the increased thickness of the head body and its various parts. The new design allows this small die head to easily withstand the extreme stresses imposed when threading special alloy steels.

The 5HH **LANDMATIC** Head has a notably small number of working parts. All parts are made of special alloy steel, and are hardened and precision ground. Left-hand threads may be cut by using left-hand chaser holders and regrinding the same set of chasers. More information available on request.

LANDIS *Machine* COMPANY WAYNESBORO PENNSYLVANIA

Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

For every test on drilling mud and for the precision equipment to make the tests...



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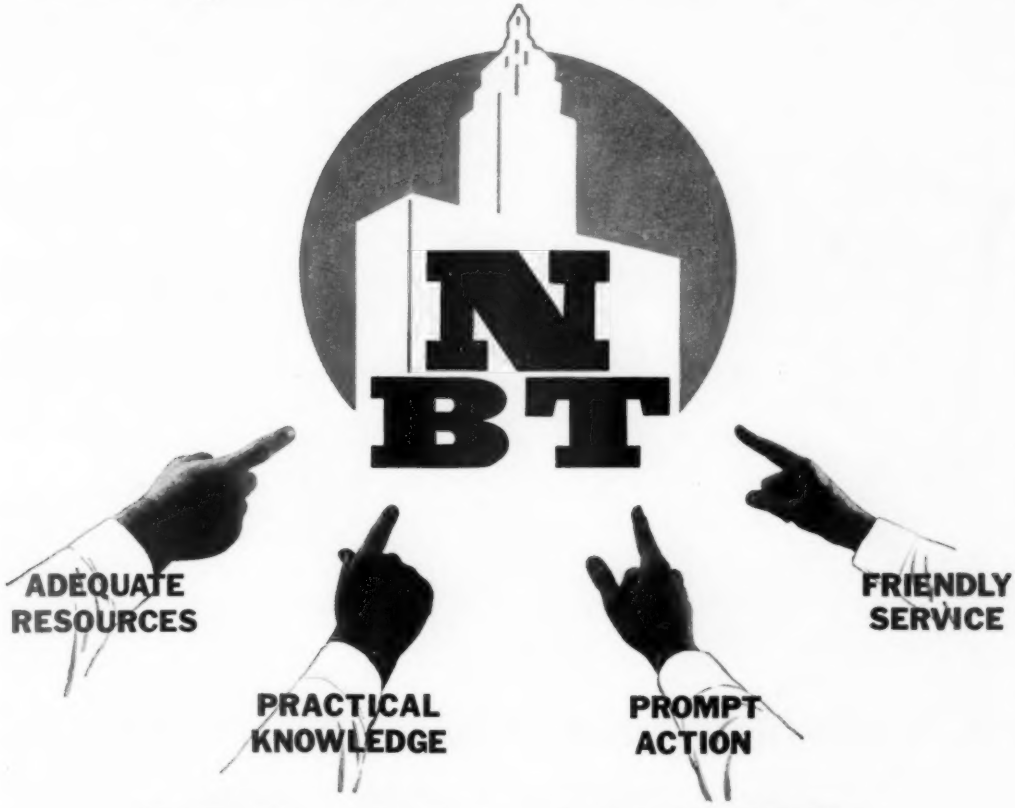

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...Greatest Improvement in Tank Heating in 30 Years

Brown Fintube Thermo-Flo Tank Heaters are more efficient, and usually *cost less plus their installation,* than the cost of just installing equivalent capacity of old fashioned bare pipe coil in the bottom of the tank.

Brown Thermo-Flo heaters mount vertically, on adjustable legs about 12″ above the tank bottom, thus preventing depositing on the tubes; and avoiding the lost efficiency of heating the tank bottom, and a layer of sediment. The bottom of the tank is uncluttered and easy to clean. The entire surface of the fintubes is exposed to the tank contents. Material adjacent to the fintubes is heated quickly and rises rapidly, forming a thermal syphon or flow past the fintubes; keeping the heating surfaces clean; assuring extremely efficient heating; and preventing any stratification of temperature or gravity in the tank.

Due to the large surface area of the fintubes, low steam or water temperatures can be used for heat sensitive materials, and high steam temperatures for rapid heating, without danger of coking.

The popular TF-20 heater, pictured above, has 265 sq. ft. of surface, equivalent to about 250 lineal feet of 4″ pipe. It connects to inlet and outlet lines with bolted flanges, avoiding welding, and can be installed in either existing or new tanks. Highly endorsed by operating and maintenance men. If you are not already using Thermo-Flo heaters in your tanks, we urge you to *write for Bulletin No. 491 today!*

BROWN FINTUBE CO.

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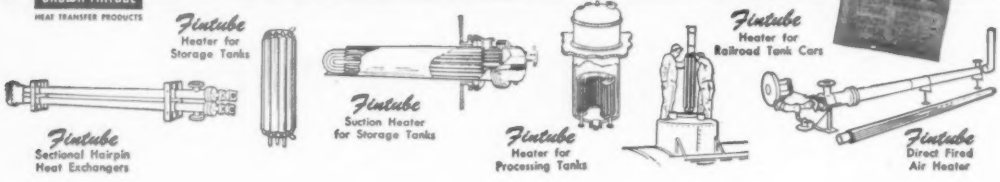
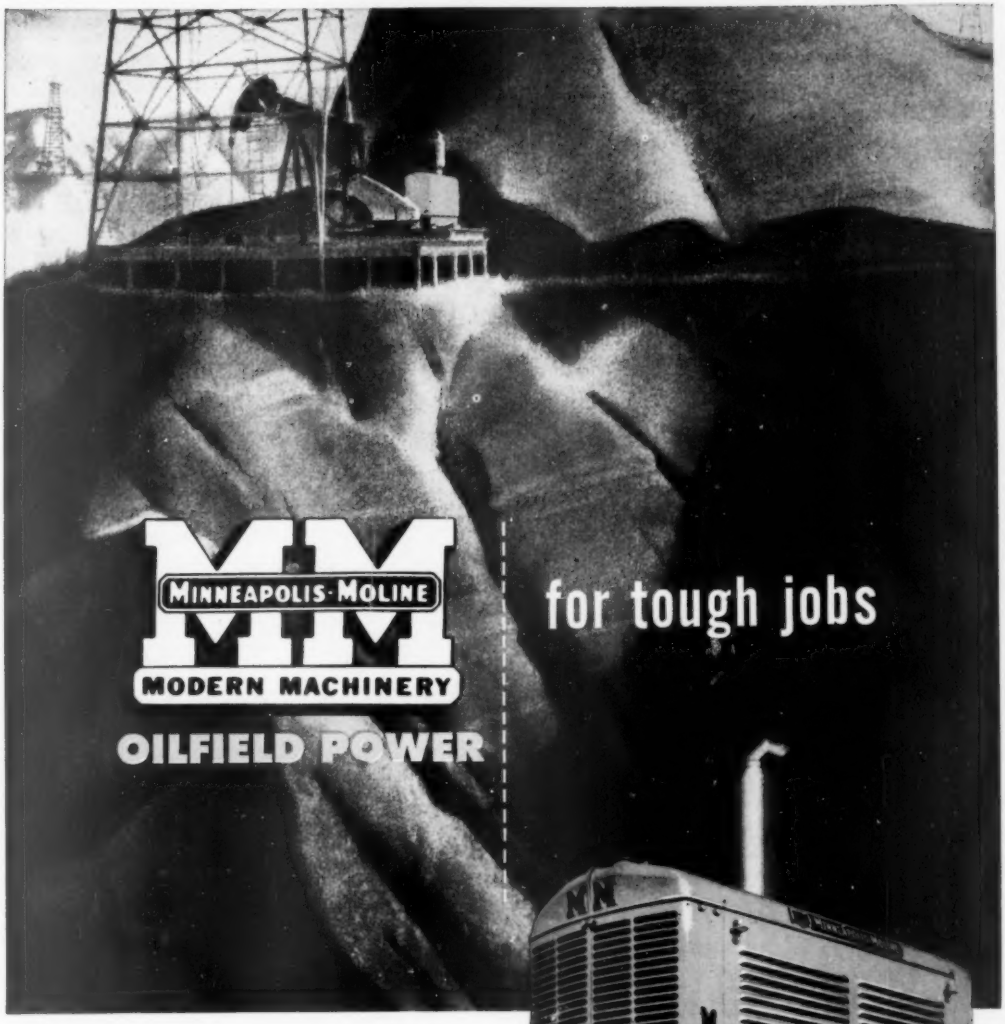
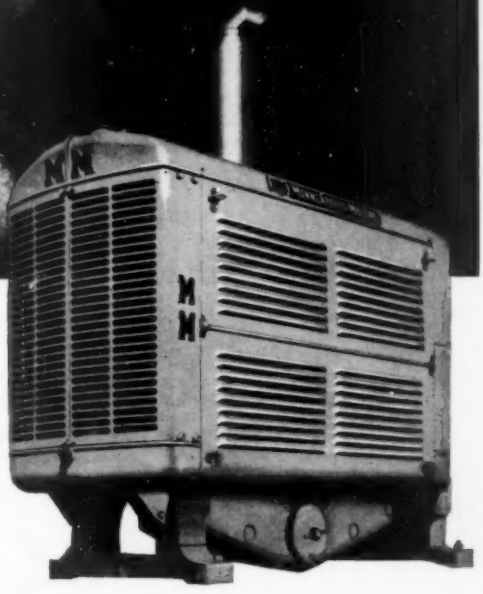
IT WILL GIVE YOU IDEAS

HEAT EXCHANGE SURFACE
BROWN FINTUBE
HEAT TRANSFER PRODUCTS







How can this engine operate 24 hours a day for 8 to 10 years without overhaul? Here's the secret—controlled lube oil temperatures and elimination of lube oil contaminants.

Superior methods of filtration cleanse the air, fuel, lube oil and crankcase vapors. Exclusive MM water jacketted base pan maintaining 190° constant lube oil temperature eliminates sludge formation which in ordinary engines combines with dirt and grit to destroy moving parts. Heavy fine grain engine castings easily take severe shocks and strains imposed by oilfield loadings.

Result: Years of economical trouble free operation.

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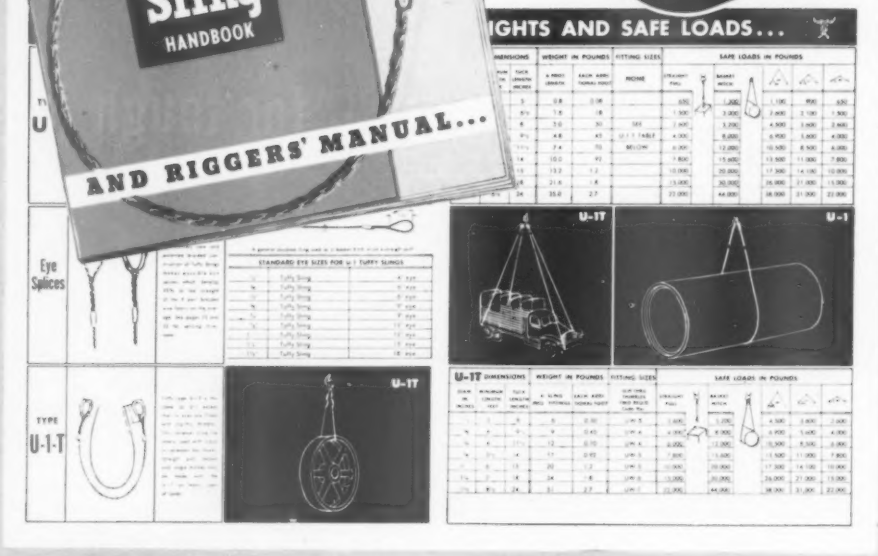

union Wire Rope

the Press and Ready You Cut Sling Costs!

Only Handbook of its Kind in the Sling Field. You just can't measure Tuffy Slings by the old sling standards. Because of the new characteristics and efficiencies developed in Tuffy's 9 part, machine braided wire fabric construction, all users of slings need this Sling Handbook to know the facts about lower sling costs through longer sling service. You can have it FREE for the asking. It gives you—

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You'll find this Sling Handbook and Riggers Manual easy to use and highly useful. A copy is yours with our compliments. Simply fill out and send the coupon.

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It's hard to do by hand without the aid of a vise. If you are able to kink a Tuffy, then see how easily the patented braided wire fabric straightens out without material damage.

Get FREE Sling Sample—See For Yourself All The Advantages of Tuffy Slings

To see how entirely different they are you just have to handle and try out a Tuffy Sling. That's why we have made up a supply of 3 ft. samples. Get yours and prove for yourself Tuffy Sling superiority. Fill out the coupon—It's FREE.

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MATHIESON CHEMICAL CORPORATION'S new plant at Doe Run, Kentucky, engineered and constructed by **BADGER** Process Division, Stone & Webster Engineering Corporation.

...and using the OIC

LONG LINE OF VALVES

OIC builds valves for every purpose—cast and forged steel, iron and bronze—and every valve is *precision-engineered* and *precision-made* to give longer, trouble-free service at no extra cost to you. OIC offers *precision-application* help in selecting valves best suited to each job.

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VALVES

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BREWSTER
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MODELS 18"-22"

Over twenty-five years ago, Brewster was producing these early model rotaries, forerunners of the modern RSH.

THE Brewster RSH line of rotaries is manufactured to meet the need for a rotary of exceptionally high quality. It is the culmination of years of development work in which each successive model has been fully tested in the field. Today the RSH incorporates the features which have been found most desirable in actual use by drillers and drilling contractors. Every element has been planned to offer you the ultimate in rotary design.

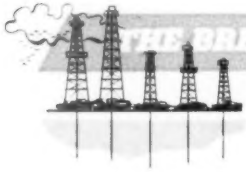
Ask your nearest supply house for full information on the Brewster RSH Rotary.

RSH IMPROVEMENTS

TRIPLE GROOVE MUD SEAL Lubricated labyrinth with three closely fitted rings seals gear compartment from drilling mud.

HOLD DOWN BEARING Anti-friction ball type bearing keeps gears accurately meshed and holds table in alignment under heavy loads.

RUGGED CAST STEEL BED Thoroughly heat treated to develop maximum physical properties. Rigid construction prevents distortion under heavy loads and maintains exact alignment of gears.



THE BREWSTER COMPANY, INC. SHREVEPORT, LOUISIANA

BREWSTER DRILLING EQUIPMENT

ASK YOUR NEAREST SUPPLY HOUSE TO TELL YOU ABOUT THE BREWSTER RSH ROTARIES

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CAST STEEL BED Thoroughly heat treated to develop maximum physical properties. Rugged construction prevents distortion under heavy loads and maintains exact alignment of gears.

TABLE LOCK Easily accessible for rapid operation.

MUD SEAL Triple groove labyrinth seals gear compartment from drilling mud.

LOCK PIN FOR MASTER BUSHING

MASTER BUSHING

FLUSH DECK Diamond tread surface affords safer footing for men working on rig.

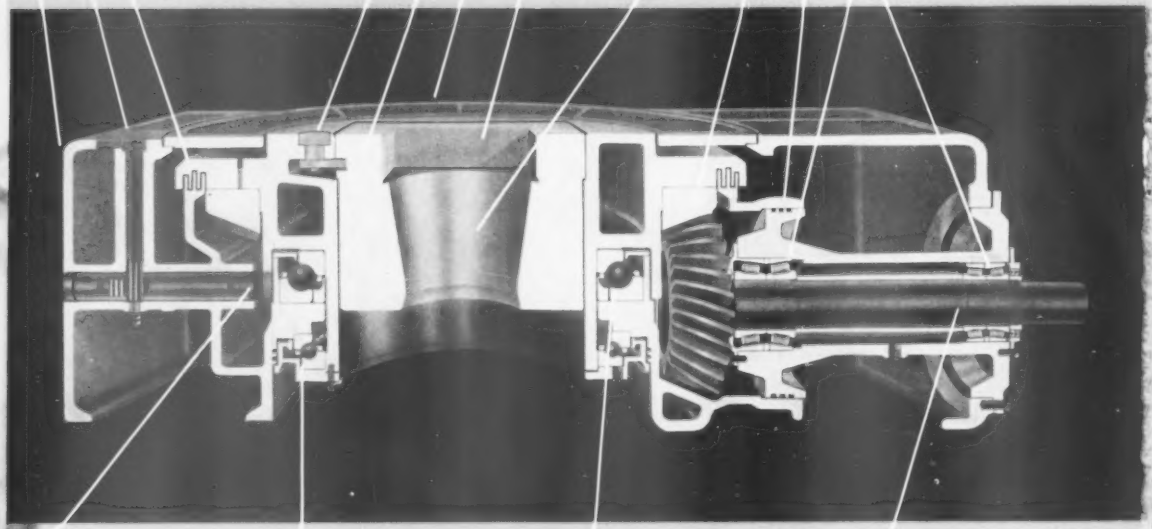
KELLY DRIVE

SLIPS

RING GEAR AND PINION Spiral bevel gears, machined from heat treated alloy steel. (oil lubricated)

OIL SEALS "O" ring type for pinion shaft cartridge assembly.

TWO ROW TIMKEN BEARINGS Non-adjustable roller type with high load capacity and resistance to shock. (grease lubricated)



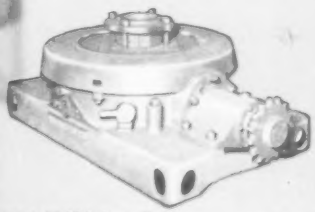
LOCK PIN Engages skirt to prevent transfer of shock to gears and bearings.

HOLD DOWN BEARING Anti-friction ball type bearing keeps gears accurately meshed and holds table in alignment under heavy loads — eliminates vertical slack in the assembly.

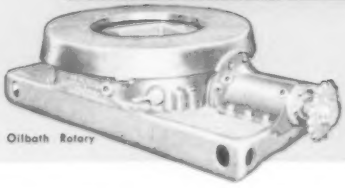
MAIN BEARING Heavy duty anti-friction ball type bearing with high load capacity has individual oil bath lubrication.

SHAFT Heat treated alloy steel, machined to close tolerance for accurate fit and smooth operation.

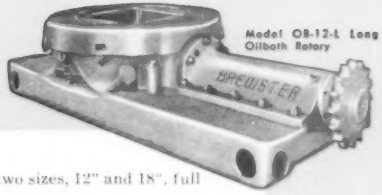
BREWSTER TYPE OB OILBATH ROTARIES



Model OB-12-S Short Shaft Oilbath Rotary



Model OB-18 Oilbath Rotary



Model OB-12-L Long Shaft Oilbath Rotary

These Brewster Model OB Oilbath Rotaries are available in two sizes, 12" and 18", full table opening. The 12" size is available in two lengths, the short model with 28½" center-to-center, the longer 44" center-to-center, and two table openings — 12" width 3"/ft. tapered slip seat and 11½" with 4"/ft. tapered slip seat to fit std. API slips.

THE BREWSTER COMPANY, INC. SHREVEPORT, LOUISIANA

NOW CEMENT WITH POZMIX

MAJOR CONTRIBUTION TO BETTER CEMENTING

Now available in quantity, Halliburton Pozmix affords many positive advantages over neat portland slurry at considerable savings! Among the most important of these exclusive Pozmix advantages are:

- Low heat of hydration and volume change
- Greater resistance to sulphates
- Less permeability than regular portland cements
- More desirable tensile and compressive strength
- Reduced leaching and solubility of set materials
- Considerable savings in overall costs

HALLIBURTON FIRST TO UTILIZE POZZOLANS FOR OIL WELL CEMENTING

As early as 1949, Halliburton tested both natural and artificial pozzolans in order to overcome the undesirable properties of neat portland cements. Today the revolutionary Pozmix, a bulk-plant blend of pozzolans and portland cement, has been used successfully on more than 1,000 wells under all types of conditions, in practically all cementing procedures.

The first Halliburton Pozmix blending plant located in Illinois was put in operation early in 1951. Facilities at El Paso, Texas, are now producing Pozmix from natural pozzolans and additional blending plants at strategic locations are rapidly nearing completion.

Recognized as the greatest contribution to better cementing in the history of oil well cementing, Pozmix is ready to offer you superior protection with longer casing life under the most severe conditions.

Contact your nearby Halliburton representative now, or write Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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Outstanding public service release currently available for civic and industrial showings

MORE than 10 million people have seen General Electric's civil defense film showing how a city prepares its communications network for vital disaster service. A dramatic documentary, the 22-minute motion picture stresses the role of communications in everyday life, depicts an atomic blast over Syracuse, N. Y. and demonstrates how the existing communication systems of a city and a county can be coordinated in an emergency. The film is a part of the nation-wide Communications Advisory Service, a G-E organization of electronics engineers whose consultation services are available to communities and industries of every size.

One of the most popular films in G-E history, "Voice" is being sponsored by civic and industrial groups across the nation to stimulate public interest in civil defense. If you want it for your community at only nominal cost for mailing, call the CAS* man at the G-E office near you, or write us. *General Electric Company, Section* ***892-29,*** *Electronics Park, Syracuse, New York.*

**Communications Advisory Service*

Freedoms Foundation president Kenneth D. Wells, presents award scroll to Roy D. Jordan (center), secretary of G.E.'s Electronics Division CD Committee, and Neal F. Harmon, G.E.'s CD Coordinator.

The film shows evacuation of residents from the city by taxicab after the atom "blast" plus many other eye-opening scenes. Will your city be prepared? Be sure to see this timely civil defense film.

Lt. General Willis Crittenberger, commanding First Army, with G.E. Vice-President W. R. G. Baker on nationwide TV showing of film. More than 30 TV stations have screened the picture as a public service.

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May be applied directly over rusted surfaces without removing all the rust!

RUST-OLEUM is the *practical, sensible* answer to your rust problems. Cuts your maintenance costs, because it may be applied *directly over rusted surfaces* after wirebrushing and scraping with sharp scrapers to remove rust scale and loose particles . . . costly sandblasting and chemical pre-cleaning are not usually required. This often enables *one man* to do the work of two with RUST-OLEUM! Practical, too . . . because RUST-OLEUM beautifies as it protects in *all colors, aluminum,* and *white.*

We'll be happy to show you convincing proof that RUST-OLEUM can cut your maintenance costs . . . and last longer when applied over rusted surfaces. Get the facts, today! Prompt delivery from Industrial Distributor stocks in principal cities in the United States and Canada.

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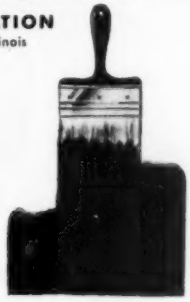
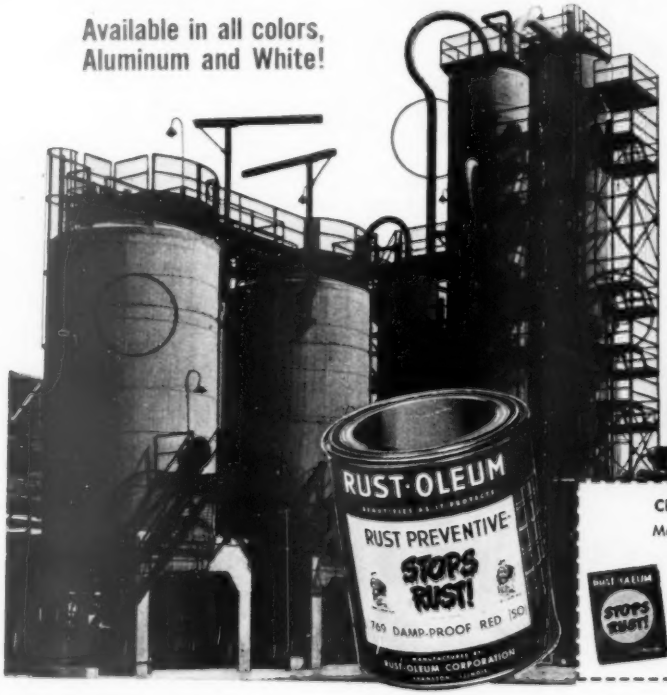


Available in all colors, Aluminum and White!



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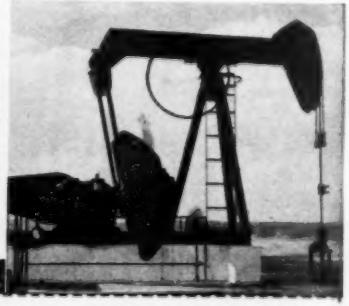

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You don't have to look it up...

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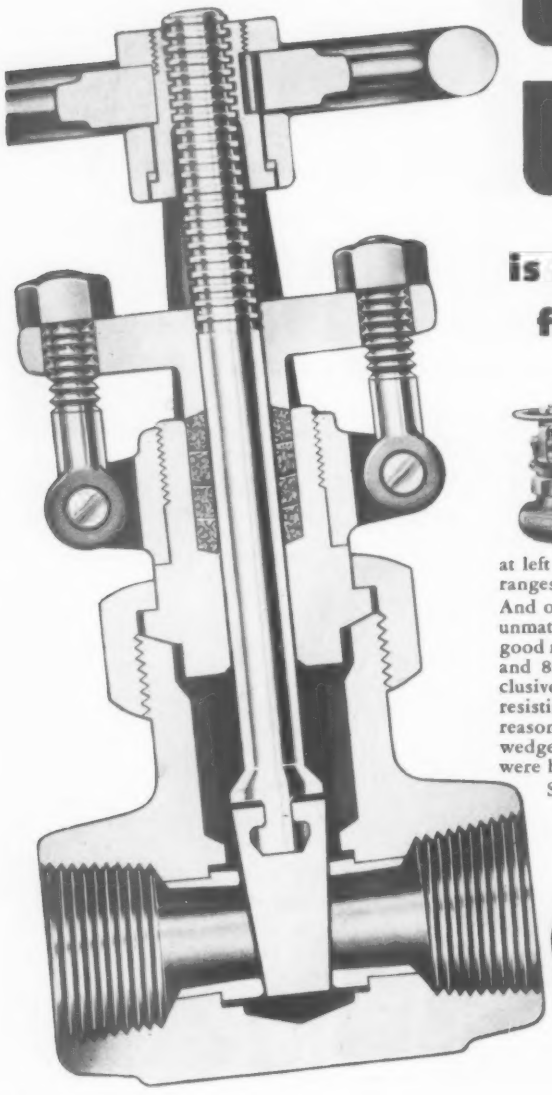


is the RIGHT NUMBER for any number of different jobs

No other small valve has as big a field of application as this Chapman List 960 Forged Steel Gate Valve. You can get it in sizes from ¼" to 2", with joints either gasketed or metal-to-metal . . . and in 2 types: Rising stem with yoke, as shown at left . . . or rising stem with inside screw. Pressure ranges from 2,000 lbs. at 100° F, to 380 lbs. at 1,000° F. And on *any* job, Chapman's List 960 shows the same unmatched ability to take it . . . and stay with it. One good reason is that hard faced Stainless steel seat rings and 800 Brinell hardening of gate faces by the exclusive Malcomizing Process, provide maximum wear-resisting and non-galling properties. And still another reason is that changes in design have made stem and wedge gate connections 50% *stronger* than they ever were before.

So if you want the biggest savings you ever got from a small valve, *specify Chapman List 960.*

THE

CHAPMAN

VALVE MFG. CO.

INDIAN ORCHARD, MASS.

new **PACKAGED** carbon dioxide

FIRE EXTINGUISHING SYSTEM

inexpensive, simple, sure!

any pipefitter can install it

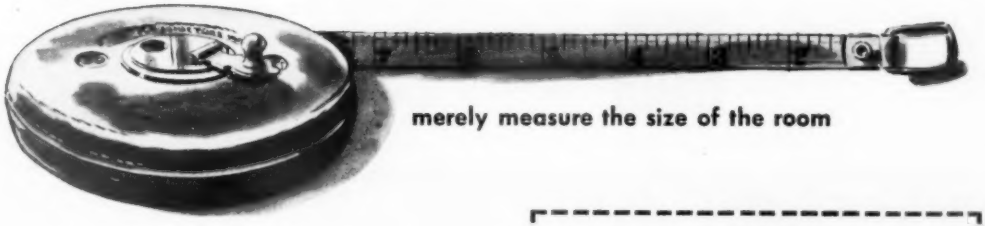
Do you want maximum fire-fighting power at minimum cost? Then you want the new Kidde Standard Pak. It's an inexpensive ready-made system you can build in for protection against tough fires in normal flammable liquid hazards.

Anyone who can cut pipe can set up this pre-engineered fire extinguishing "package." Choose from six sizes for volumes up to 6,000 cubic feet.

Every kit contains Kidde rate-of-rise heat detectors, Kidde Multijet nozzles, and automatic discharge heads. Pipe and fittings are optional, as are pressure trips and switches, remote controls, sirens, gongs.

For full information send the coupon.

pre-engineered



merely measure the size of the room

Kidde

Walter Kidde & Company, Inc.

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WALTER KIDDE & COMPANY, INC.
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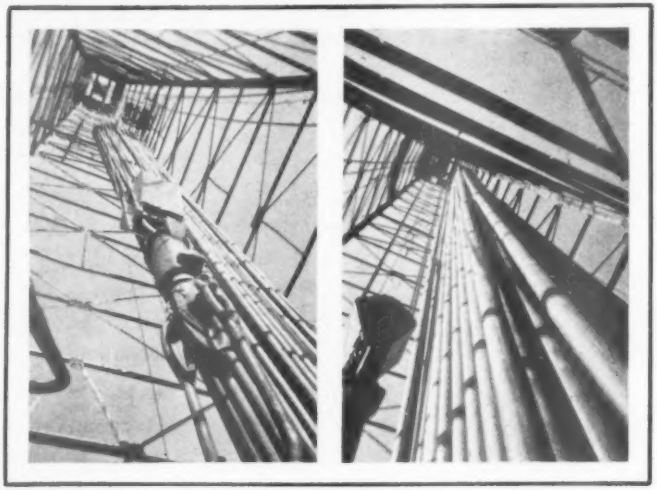

A man's selection of drill pipe and wire rope, essentially companion products, earmark his taste and judgment. A man likes to drill a well with good equipment, for the same reasons he likes to drive a good car and own a nice home.

For really interesting, pertinent facts about Drill-Pipe and Wire-Rope performance in your area, ask any Jones & Laughlin Supply man or write us at Tulsa.

J&L STEEL

J&L DRILL PIPE. For meeting the requirements of modern drilling, many Toolpushers are convinced that J&L Integral Joint Seamless is unsurpassed. Made of Blue Ribbon Steel in Full Hole and Internal Flush Design.

J&L STEEL

J&L WIRE ROPE. While wire rope is "just a maintenance item", it costs the industry around a hundred thousand dollars every day! For the toughest drilling line that runs down to a drum, countless Toolpushers put their money on J&L Wire Rope to win.

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Subsidiary of Jones & Laughlin Steel Corporation

Save Maintenance Expense

Pipe coated and wrapped by Hill, Hubbell is insurance against unnecessary maintenance expense.

Hill, Hubbell protected pipe lasts longer because we have absolute control over every step of the process. First the pipe is cleaned metal-bright with Roto-Grit Blast. All coatings and wrappings are precision applied at uniform temperatures. Every length is inspected with electronic holiday detectors before leaving the factory.

Hill, Hubbell and Company

Division of GENERAL PAINT CORPORATION

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★ Railroad in transit privileges

Are you acquainted with this type of HYATT bearing?

Here is the Industrial Inch 70,000 Series three-part Hyatt Roller Bearing designed for large diameter, slow speed shafts in heavy equipment where fractional dimensions are the rule.

The races are made from alloy steel forgings which are heat-treated to obtain the greatest possible strength and durability, then finish-ground to close tolerances. The roller assembly is made up of two bronze end rings drilled to pocket the roller ends and riveted to steel spacing bars.

Built to fulfill specific requirements, this Industrial Inch Bearing, like all the other Hyatt Bearings employing solid or wound rollers, is proving most satisfactory for its particular application.

* * *

Write for Catalog No. 150 for further details in the Inch Series and all the other popular Hyatts for all your bearing needs. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

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FOR CAPABLE ASSISTANCE
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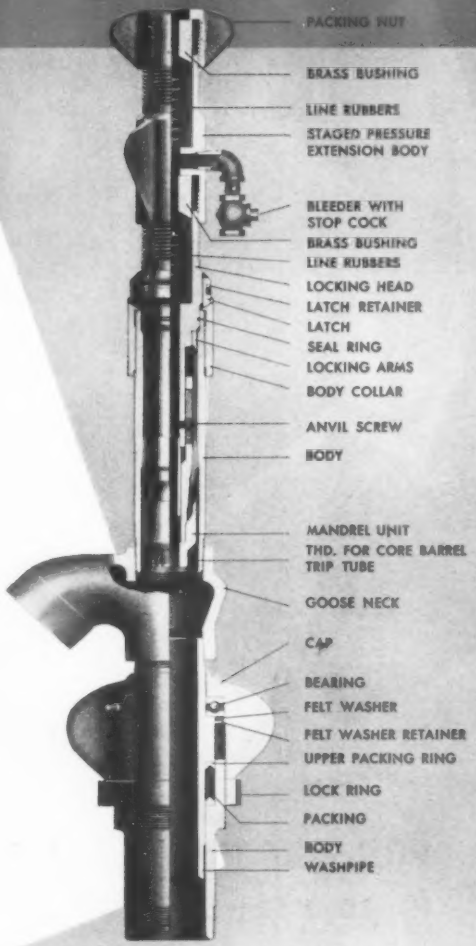
WIRE LINE PRESSURE CONTROL



For

Efficient, dependable protection

with controlled pressure and flow

- PREVENTS BLOWOUTS
- DIRECTS FLUID FLOW
- SAVES DRILLING MUD
- ELIMINATES FIRE HAZARD
- SAVES FISHING JOBS
- KEEPS RIG FLOOR SAFE

The Bowen Wire Line Pressure Control is standard for use with tools on wire line — swabbing — bailing — taking cores — running scrapers or surveying instruments.

This tool combines a Bowen Automatic Line Wiper with a Staged Pressure Extension and a Bowen Circulating Swivel. Precision manufactured it furnishes a means of using wire line tools effectively without blowout and fire hazards, assures proper mud circulation without tool damage; saves drilling mud — provides a means for directing fluid flow to selected outlets.

Easy to install and operate — it is available in standard sizes. Write for literature.

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Industry has made it a habit to look for the trade-mark "TIMKEN" when buying tapered roller bearings, alloy steel bars or rock bits. Why not make "TIMKEN" your "buy word" too? There's over 50 years of experience behind it. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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HIGH SPEED ROTARIES

A-17-A 17½" Opening through table 53¼" Centers
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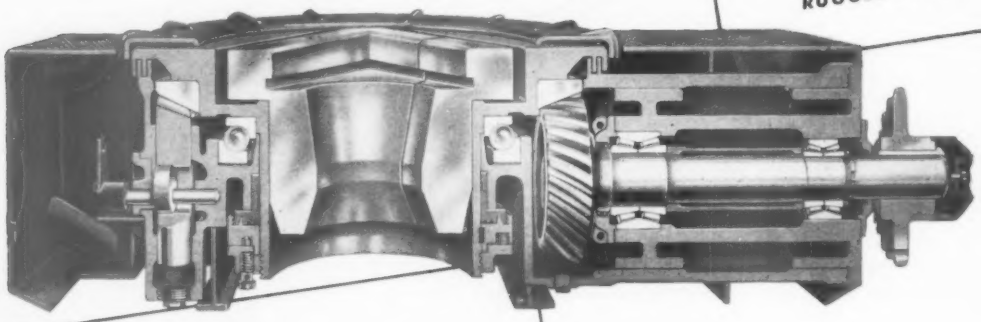
PRECISION BUILT
EASY TO MAINTAIN
CUTS RIGGING UP TIME
RUGGED . . . QUIET



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CARTRIDGE TYPE PRESSURE GREASE LUBRICATED PINION
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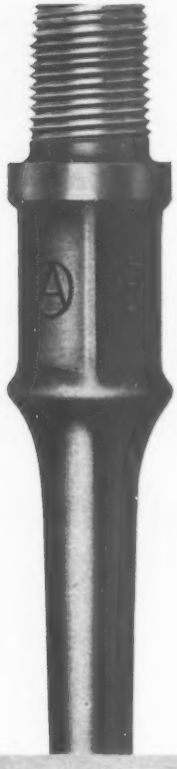

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N727

Men's Black Glove Blucher Anchor Flange Steel Set Toe, Oxford One Piece Steel Fiddle Quarter, Black Cord and Leather Full Double Sole, Wingle Cord Heel, Steel Arch, Protector Last, Welt Construction.

BoL Tan

sweat-resistant leather insole

gives HY-TEST Safety Shoes up to TWICE THE WEAR!

Only HY-TEST Safety Shoes have BoL Tan sweat-resistant leather insoles!

ACTUAL WEAR TEST PROVES BOL TAN LEATHER INSOLES

Sweat-Resistant

Here are two insoles from a single pair of shoes worn in a foundry for seven months. The one from the left shoe is a BoL Tan leather insole; the other is a regular quality leather insole.

Note the BoL Tan leather insole is still soft and pliable, shown by cut section lifted for inspection!

The BoL Tan leather insole stays comfortable, permits re-soling when ordinary insole would have failed!

Ordinary insole is cracked, curled, saw-edged . . . dried out and damaged by perspiration attack!

Ordinary insole is unfit for further wear causing discard of shoe long before uppers are worn out.

Only the BoL Tan leather insole resists the damaging attacks of perspiration!

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SHARP, SNAPPY, DRILLING ACTION

Bucyrus-Erie spudders pack a one-two punch for fast footage.

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But fast hole penetration is only part of Bucyrus-Erie's low-cost drilling story. Your distributor can tell you all — why Bucyrus-Erie is the first name in spudders. 130552

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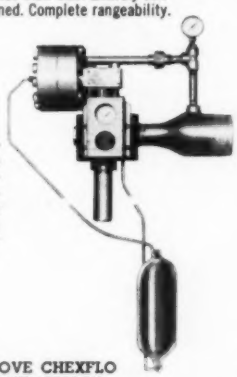
Latest application of Grove's exclusive Powreactor Dome principle in a regulator for high pressure field services. May be used as a pressure reducing or back pressure regulator without change of internal parts. Also usable as automatic overpressure or underpressure shut-off.



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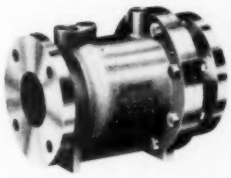

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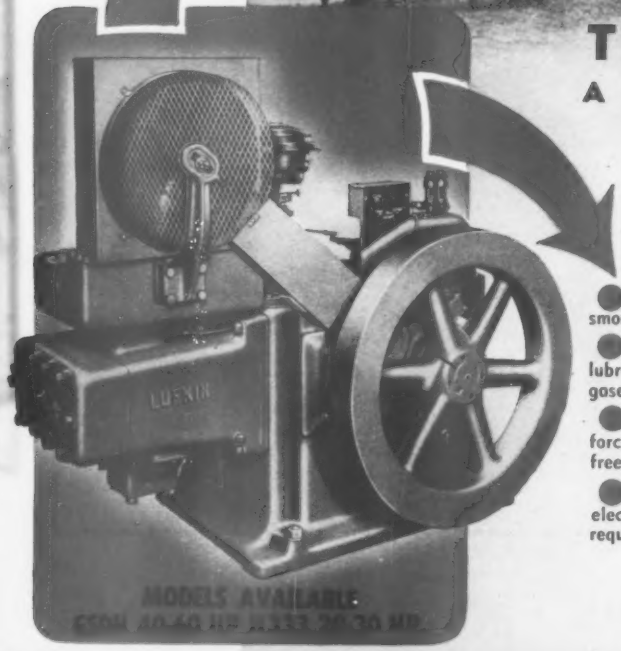
Lufkin ENGINES



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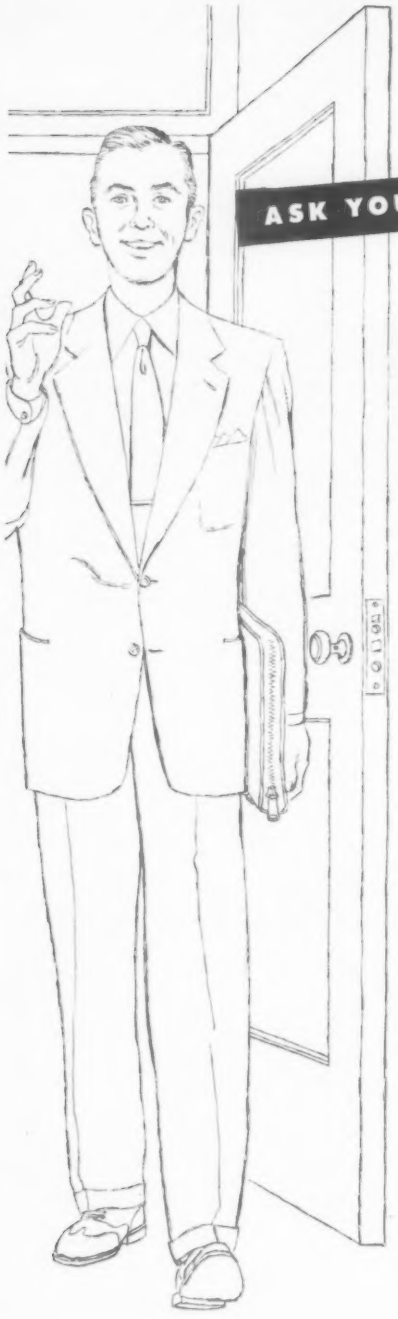

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What's New...

He'll tell you how we can now serve you better than ever before . . . because a lot has happened at Mathieson since contract season last year. He'll discuss in detail:

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2. Our new facilities for production of nitrogen products, including large additional production of ammonia from Morgantown.
3. Our new and expanded alkali-chlorine facilities, including electrolytic production at Saltville, Va. and a new electrolytic plant at McIntosh, Ala.
4. Our new organizational set-up to better serve our customers.
5. Our new ideas for the economical distribution and use of Mathieson Chemicals.

These and other new Mathieson developments are worth hearing about. *Our* plans for tomorrow might well fit into *your* plans for tomorrow. Let's talk about 1953!

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Bicarbonate of Soda	Chlorine Dioxide	Diethylene Glycol
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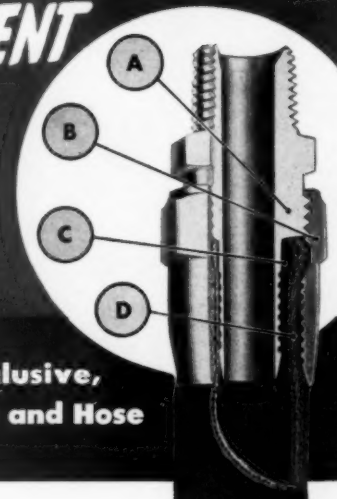
OIL-FIELD EQUIPMENT

stays "on the job" SAFELY, DEPENDABLY,

. . . when you use Anchor Exclusive, Patented Reusable Couplings and Hose



HOW IT WORKS

The thread on the body of the insert (A) and on the shell (B) is correctly designed to insure positive engagement and help prevent stripping. Anchor's exclusive patented grip provides additional packing of the hose in recess (C) and a uniform compression area (D).

All the things you want most in LPG, oil, air, and water hose assemblies — safety, dependability, easy assembly, neat appearance, lower inventories — are yours with Anchor 2-piece reusable couplings. Oil-field equipment manufacturers and users know that Anchor Couplings prove themselves under the most rugged field conditions. Anchor's exclusive patented design means money, time, and trouble saved for you, too. Look at these distinctive features:

EASY, FAST ASSEMBLY. The only tools needed to assemble couplings and hose are a wrench, an oil can, and a vise. It's that simple! Couplings can be used over and over again.

SAFER, MORE DEPENDABLE. Anchor's exclusive patented grip *keeps* hose assemblies performing *dependably* day-in, and day-out without attention — prevents leaks and dangerous blow-offs.

LOWER INVENTORIES. Costly prefabricated hose assembly inventories are eliminated. Just carry one coil of hose in the sizes you use. Cut it to lengths you need *when you need them.*

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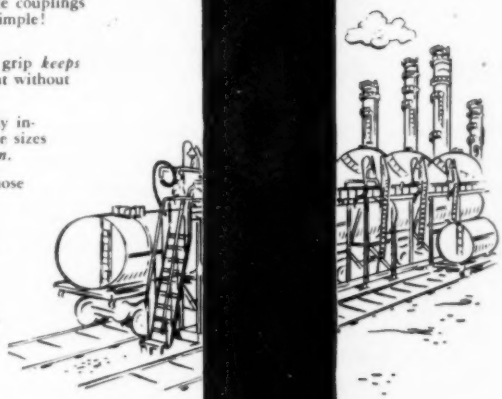
STREAMLINED DESIGN. Your jobs are neat and efficient, even in tight corners.

All the advantages in the most complete line of hydraulic hose assemblies and fittings available are yours with Anchor — advantages that mean your hose assemblies last longer, perform better, handle easier. So specify Anchor. Send coupon for further information.

ANCHOR



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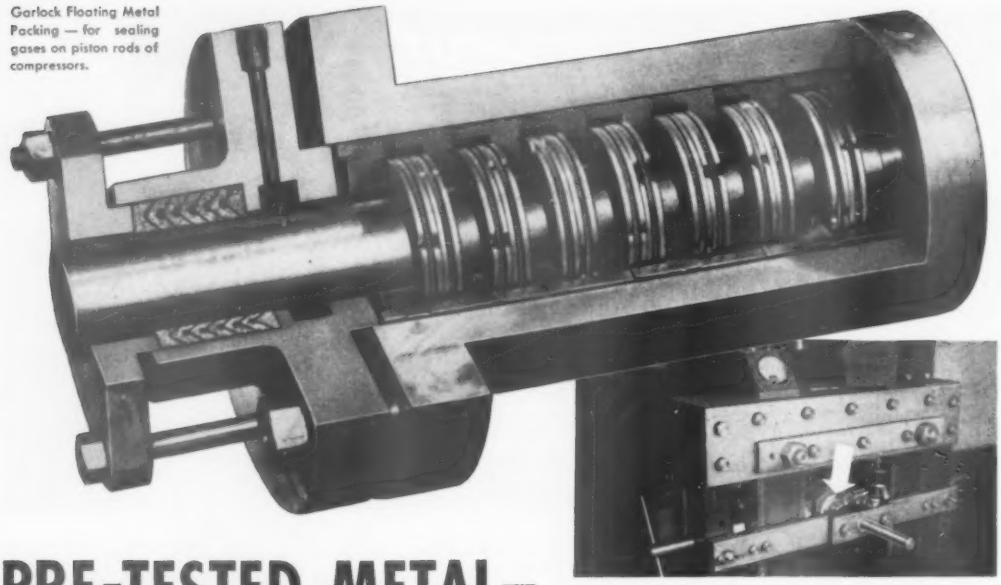
Garlock Floating Metal Packing — for sealing gases on piston rods of compressors.



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Above: Arrow points to foundry specimen being wear-tested on specially designed machine.

Your assurance that Garlock Metal Packings are right for the job!

Designed specifically for high pressure and high temperature service to seal air, ammonia, steam or any gas on piston rods of compressors and steam engines, Garlock Metal Packings are quality-controlled throughout their entire manufacture.

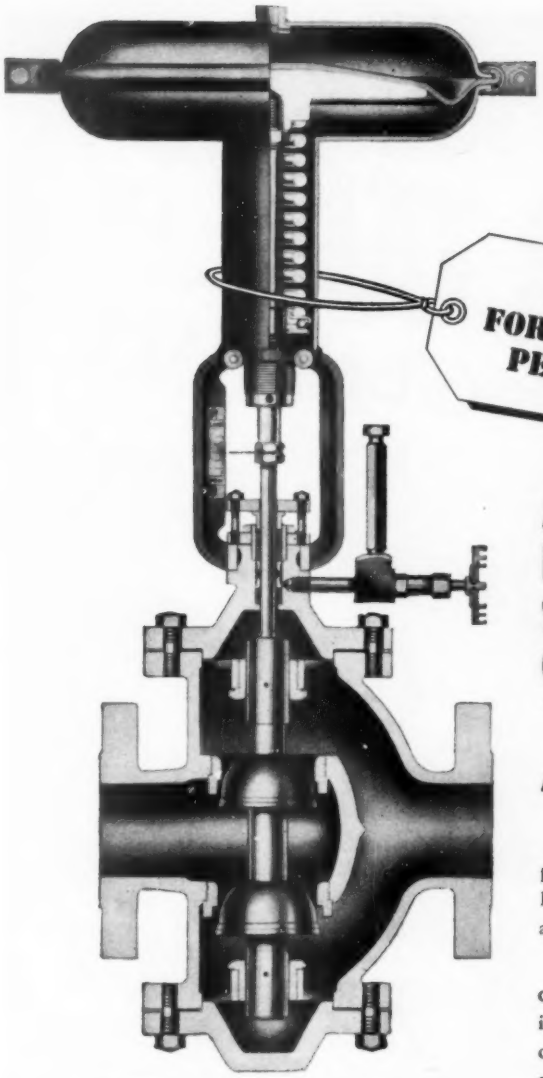
Starting with the metals of construction, every "heat" of cast iron and bronze is accelerated-wear-tested on a special machine by an independent organization before the materials are shipped to Garlock. If the wear test specimen does not pass Garlock's rigid standards, then the entire "heat" is rejected.

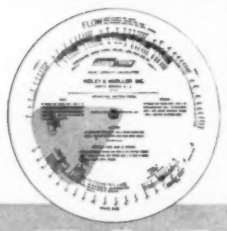
Then, using these tested, high-grade materials, Garlock Metal Packings are accurately machined to exacting specifications by experienced craftsmen. Throughout every operation extreme precision is the watch-word.

The product of this rigid pre-testing and precision manufacture is a metal packing that you can be sure will meet your service requirements. So, standardize on Garlock Metal Packings—they last longer, require less maintenance.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
Tulsa, Okla. Houston, Tex.
Los Angeles, Calif.

GARLOCK FLOATING METAL PACKINGS





This extremely accurate circular slide-rule type K&M valve capacity calculator includes correction scales for steam quality, liquid and gas specific gravity and a flowing temperature scale for gases. Sent without charge in response to a request on your business stationery.

AMERICA'S LEADING INDUSTRIES PUT THE STAMP OF APPROVAL ON KIELEY & MUELLER CONTROL VALVES

Make It Your Business to Find Out Why!

All over the country leading companies in the process industries are solving tough problems with K & M control valves, designed especially for precise and positive control by instrumentation.

More and more, as the outstanding performance of these superbly engineered valves becomes known, important companies with pressure and flow applications are turning to K & M for the skill, knowledge and experience that assure reliable automatic control of pressures, temperatures, rates of flow and liquid levels.

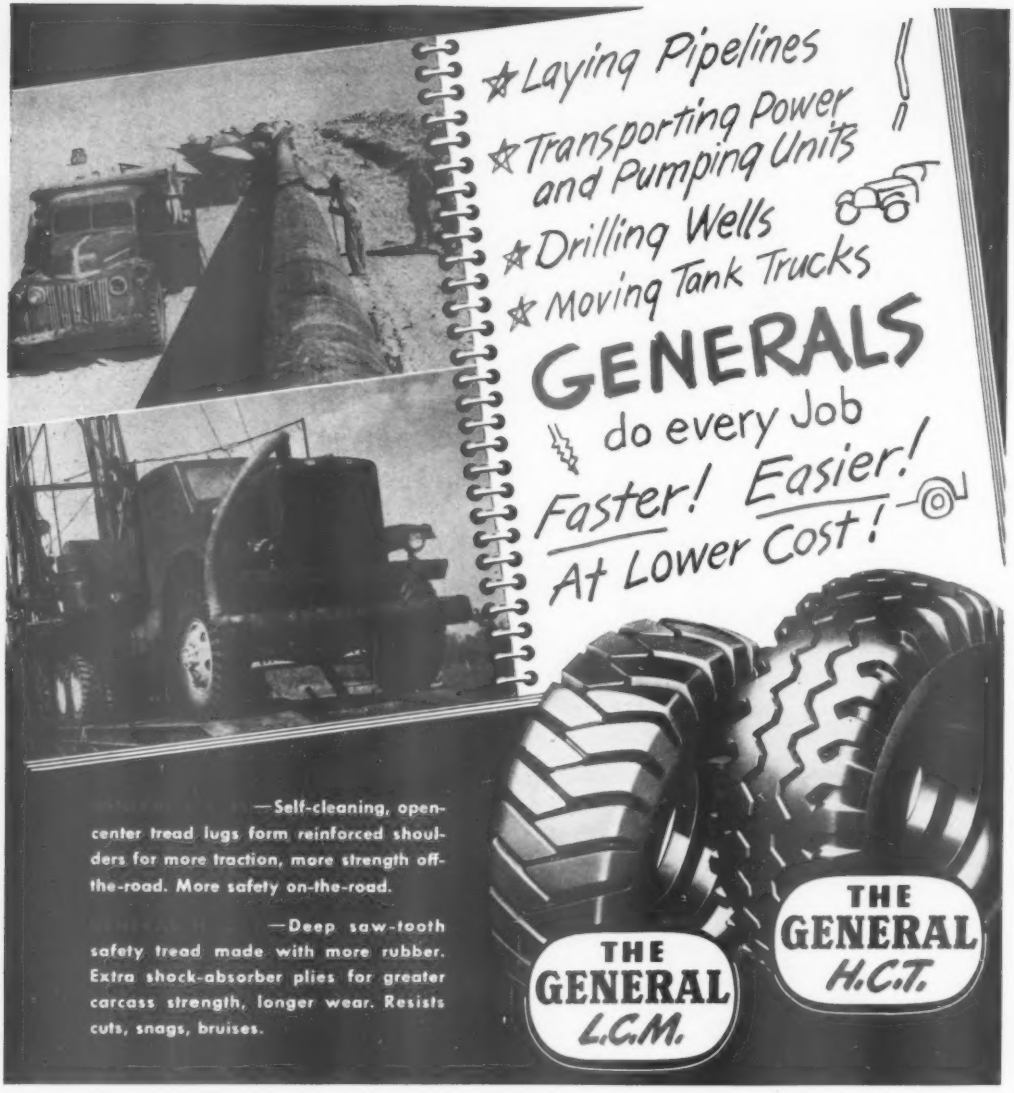
There is a qualified K & M representative near you, eager to discuss your control problems and able to provide the most satisfactory solution.

K&M

KIELEY & MUELLER, INC.

Valve Makers Since 1879.

2033 - 43rd STREET NORTH BERGEN, N. J.


★ Laying Pipelines
★ Transporting Power and Pumping Units
★ Drilling Wells
★ Moving Tank Trucks
GENERALS
do every Job
Faster! Easier!
At Lower Cost!
—Self-cleaning, open-center tread lugs form reinforced shoulders for more traction, more strength off-the-road. More safety on-the-road.
—Deep saw-tooth safety tread made with more rubber. Extra shock-absorber plies for greater carcass strength, longer wear. Resists cuts, snags, bruises.
THE GENERAL L.C.M.
THE GENERAL H.C.T.

Make Every Worn Tire Work Longer for More Profit!

Your GENERAL TIRE DEALER will KRAFT SYSTEM RECAP Worn Tires with the New GENERAL Truck Tire Tread of Your Choice

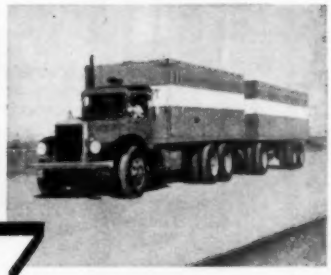
KRAFT SYSTEM RECAPPING
A GENERAL TIRE SERVICE

You're throwing away money when you throw away worn tires or accept an ordinary "adjustment" for them. Let your General Tire Dealer—a tire expert—restore worn tires with famous factory controlled Kraft System Recapping. You choose from the complete line of on and off-the-road new General Tire treads and he'll put that tread on your worn tire. He can do sectional repairs too. Get Kraft System Recapping—get more profit from every tire.

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT

FOR EVERYTHING THAT RUNS_

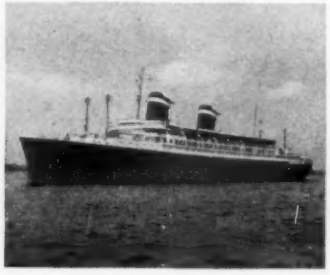
There's a Right Flying Red Horse Product!

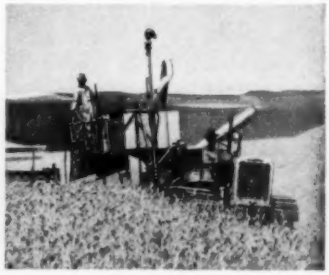


SOCONY-VACUUM

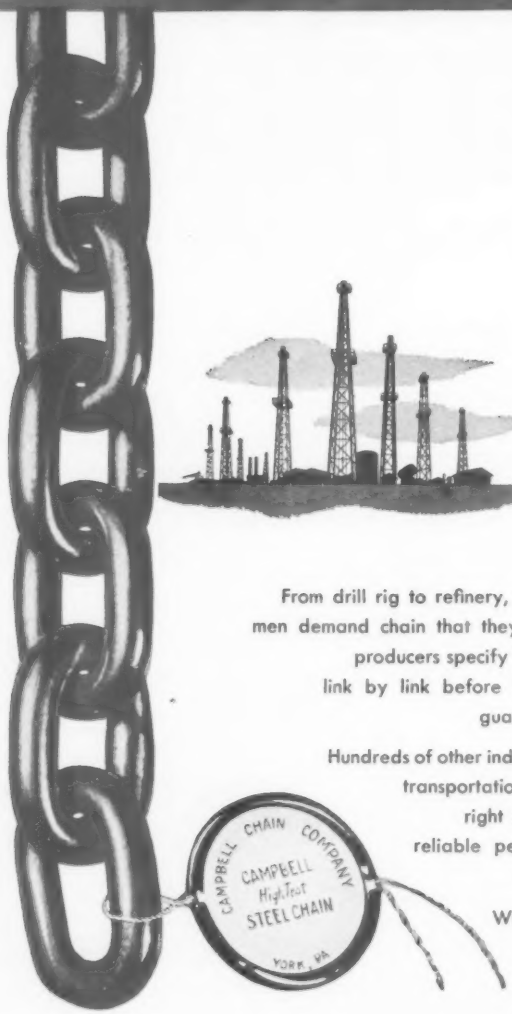
On highways and skyways . . . rails and ocean lanes—for every type of engine there are Flying Red Horse products to provide peak power and protection. Constant research keeps these products unsurpassed in quality . . . assures Flying Red Horse leadership in meeting the requirements of present—and future—engine designs.

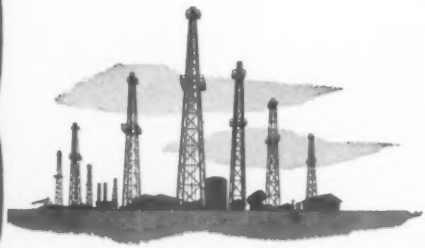
SOCONY-VACUUM OIL CO., INC.
and Affiliates
MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION





Oil men never take chain for granted!





From drill rig to refinery, through production and transportation, oil men demand chain that they can depend on. That's why leading oil producers specify Campbell Chain . . . chain that is inspected link by link before it leaves the factory. This is Campbell's guarantee that the chain is safe and sure.

Hundreds of other industries—among them mining, manufacturing, transportation, agriculture—look to Campbell for the right chain to fit their specific needs. Years of reliable performance have proved the long-lasting dependability of Campbell Chain.

When you need chain, for any purpose . . . in any grade, be sure to order it by the name—Campbell. Or, when you have an unusual problem involving chain, call the Campbell representative in your area. Take advantage of his experience.

Chain for every need . . . INDUSTRIAL . . . MARINE . . . FARM . . . AUTOMOTIVE

CAMPBELL CHAIN *Company*

MAIN OFFICE—YORK, PA. • *Factories*—York, Pa., and West Burlington, Iowa

CAMPBELL CHAIN

MAKERS OF FAMOUS CAMPBELL LUG-REINFORCED TIRE CHAINS

INTEGRATION... *in design, manufacturing, and supply service*

Superior IDEAL SPANG

When National Supply engineers begin development work on drilling and production equipment they're able to start with a vast fund of co-related information on the progressive techniques of the petroleum industry gained during years of working with operators throughout the world. This covers not only rig or pumping unit performance but deals also with drilling engines, sucker rods, derrick equipment, drill pipe—the whole and completely integrated list of oil field products which bear the familiar trademarks of Ideal, Superior, Spang, National.

As a result, these National Supply engineers are not limited by the consideration of any single item of equipment. Instead, their thinking is based on the complete line of National's oil field machinery which is designed and built to work together—then fully tested under the watchful eye of the National field organization.

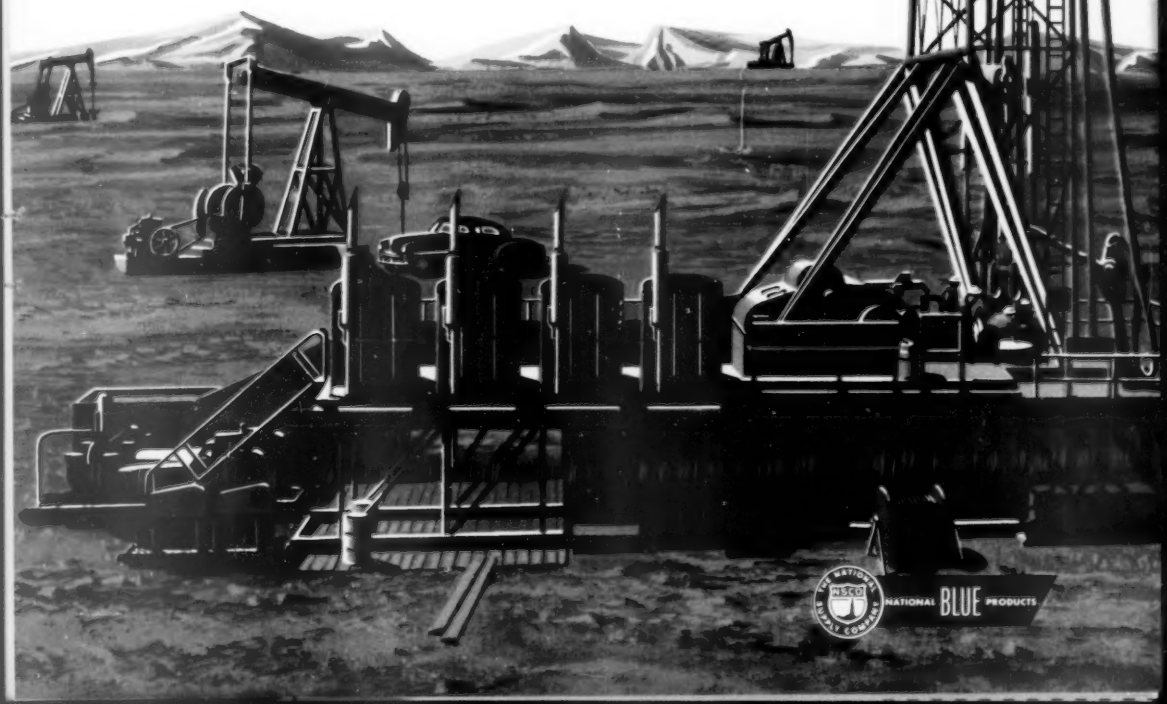
But integration doesn't stop with the development and manufacture of equipment, nor with the research and testing of National products. It's the vast network of oil field stores in the United States and Canada and the world-wide overseas service organization, which completes the integration of National Supply from engineering right through to distribution.

The oil field supply service is an expanding function of National Supply, growing in scope and direction wherever new fields are opened. New stores, with complete stocks of equipment, maintenance and operating supplies, together with thousands of accessory items, are being opened at frequent intervals at the industry's rapidly expanding frontiers. As new oil fields are developed in other parts of the world, the representatives of National Supply are right on the job there, too.

These completely integrated supply and equipment manufacturing functions make it possible for you to find everything that's new and everything that's standard in oil drilling and production machinery and supplies at the National Supply Store nearby, or through National's overseas representatives.

THE NATIONAL SUPPLY COMPANY

General Sales Offices: Pittsburgh 30, Pennsylvania



for shallow wells or deepest drilling operations

... integrally designed

IDEAL RIGS, ROTARIES AND DRIVE GROUPS

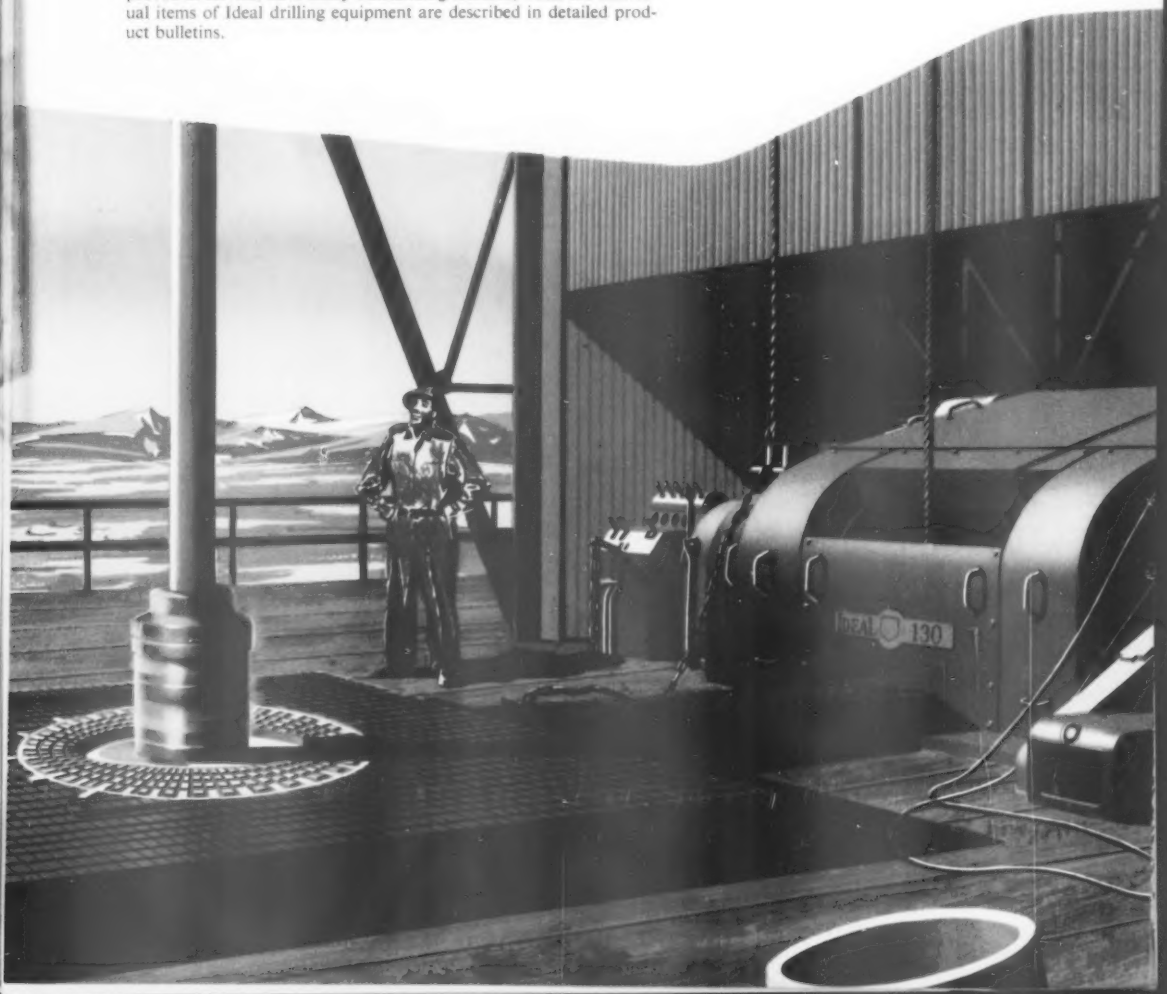
One of the most striking results of the practice of building a full line of equipment to work together is evident in the complete catalog of Ideal rigs and rotaries, Ideal sectionalized drive groups, Ideal pumps, and Superior drilling engines. In this group there are ten sizes of rigs, seven models of slush pumps, six rotary machines, together with diesel and gas engines and drive combinations for drilling at any depth.

National's development of this completely integrated machinery came about during more than a half century of close association with the petroleum industry's drilling and equipment problems.

Combinations of Ideal rigs, rotaries, and drive groups, tested and proved in service, have many outstanding features, while the individual items of Ideal drilling equipment are described in detailed product bulletins.

RIGS

- Large Diameter Drums—which decrease wear on wire lines.
- Dy-A-Flex Clutches—designed and built as integral parts of Ideal Rigs to transmit power easily and smoothly under all load conditions.
- Sectionalized Assembly—each section a completely transportable unit built to fit together with other sections so that drilling equipment can be quickly set up and accurately aligned with ordinary field rigging and tool equipment.
- Air Controls—which centralize operation at the driller's station for faster and more efficient drilling.
- Fluid Drives—provide flexible and smooth power transmission from engines operating at optimum r.p.m., and obtain more effective work from the driven machinery by automatic load-speed compensation.



ROTARIES

- Heavy duty ball type main and hold down precision bearings.
- Spiral bevel gears with hardened teeth.
- Complete seal against mud and foreign material.
- Non-skid tread safety top.
- Positive lubrication.
- Sizes to match Ideal drawworks for every drilling requirement.

DRIVE GROUPS

- Sectionalized construction, each section a complete engine-equipped unit.
- Wide Power Range, with engine and drive combinations from 80 to 2010 input horsepower.
- Integral and Independent Pump Drives, adaptable for any fluid requirement.
- A choice of three types of transmissions, mechanical, Ideal Gyrol, or torque converter.

THE NATIONAL SUPPLY COMPANY

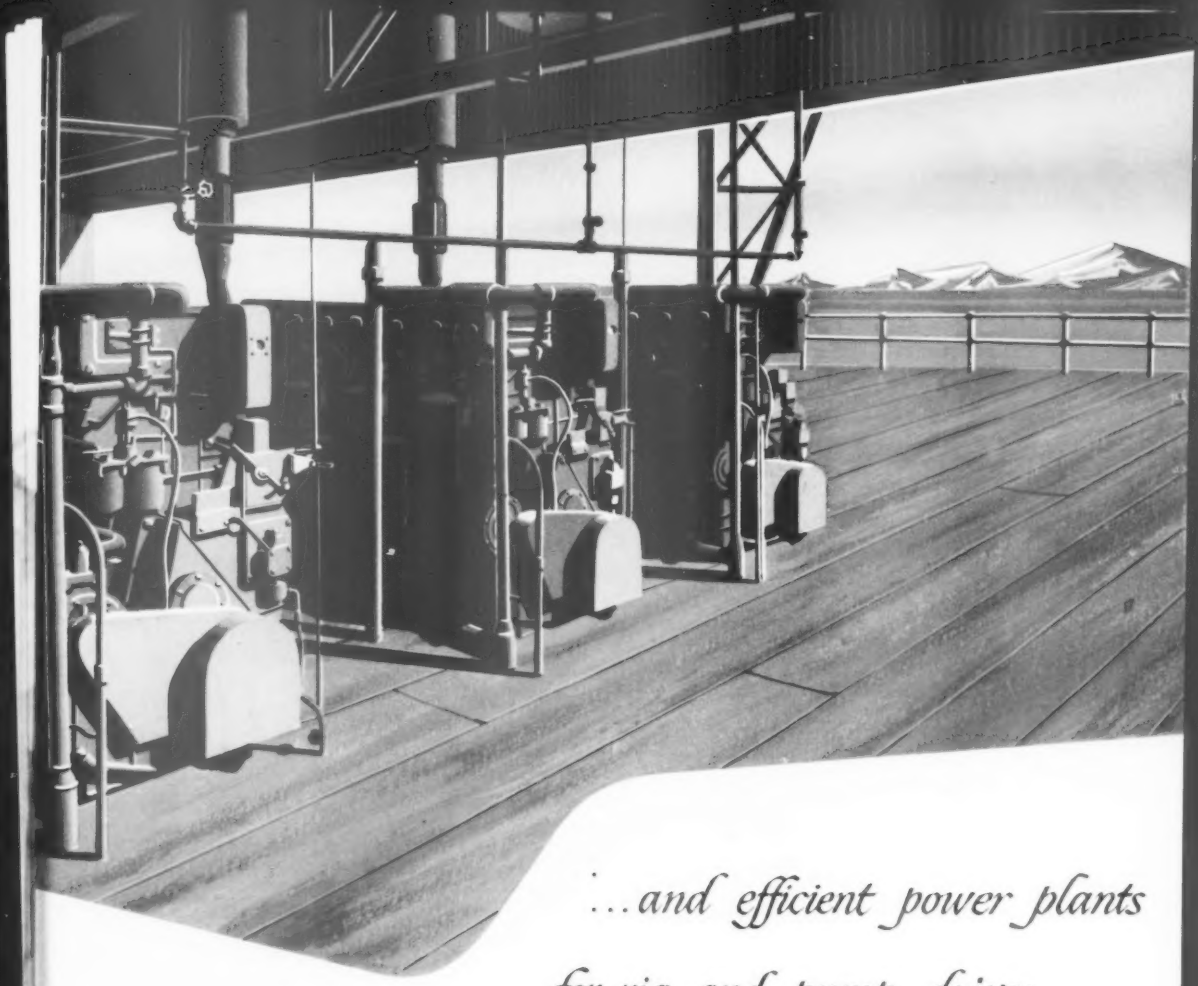
GENERAL SALES OFFICES: PITTSBURGH 30, PA.

DIVISION OFFICES: Casper • Ft. Worth • Houston
Pittsburgh • Tulsa • Torrance

CANADA: The National Supply Company, Ltd., 702 Barron Bldg., 610 Eighth Ave., West, Calgary, Alberta

EXPORT: 600 Fifth Ave., New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London, E.C.2

NATIONAL BLUE PRODUCTS



...and efficient power plants

for rig and pump drives

Superior DIESEL AND GAS ENGINES

The development of Superior Engines for drilling and slush pump operation is further evidence of the complete integration of National Supply Equipment from basic design to field application—the practice of building drilling machinery to work together.

As single units, or in multiple arrangements with Ideal sectionalized drive groups, these dependable 4-cycle Superior Engines provide economical power for any drilling service.

The complete list of Superior Engines includes 6 and 8 cylinder diesel and dual-fuel types, naturally-aspirated or supercharged, rated from 260 to 670 horsepower, and 6 and 8 cylinder gas engines for natural gas or butane, rated from 300 to 500 horsepower. Ask at your National Supply Store for descriptive bulletins or write Pittsburgh for full information.

THE NATIONAL SUPPLY COMPANY

GENERAL SALES OFFICES: PITTSBURGH 30, PA.

DIVISION OFFICES: Casper • Ft. Worth • Houston
Pittsburgh • Tulsa • Torrance

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NATIONAL BLUE PRODUCTS

CONTINENTAL POWER IS *Specialized Power*

In the oil field, as elsewhere, Continental Red Seal power owes its fine reputation to the fact that every model is truly specialized—engineered with the needs of a specific application in mind. It delivers extra satisfaction for the simple reason that it's built to do one job supremely well. You'll find one or more models matching the exact requirements of just about every oil field job—in producing, distribution, or processing—from 10 to 270 horsepower. They're available for operation on all standard fuels—gasoline, Diesel or L.P.G.—and they're backed by parts and service facilities from coast to coast.

6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 S. SANTA FE AVE. LOS ANGELES 58, CAL.

Continental Motors Corporation
MUSKEGON, MICHIGAN

...for an impartial decision

What type bearing is best suited to your needs . . . Straight Roller . . . Tapered Roller . . . Spherical Roller . . . or some other type?

You can be sure of an impartial decision from Torrington which makes *every* type of anti-friction bearing. In addition, Torrington engineers have had broad experience in applying anti-friction bearings to virtually every type of equipment —from household appliances to steel mill machinery.

This experience and an understanding of customers' problems have proved beneficial to many manufacturers. Why not ask a Torrington engineer to help with *your* next problem?

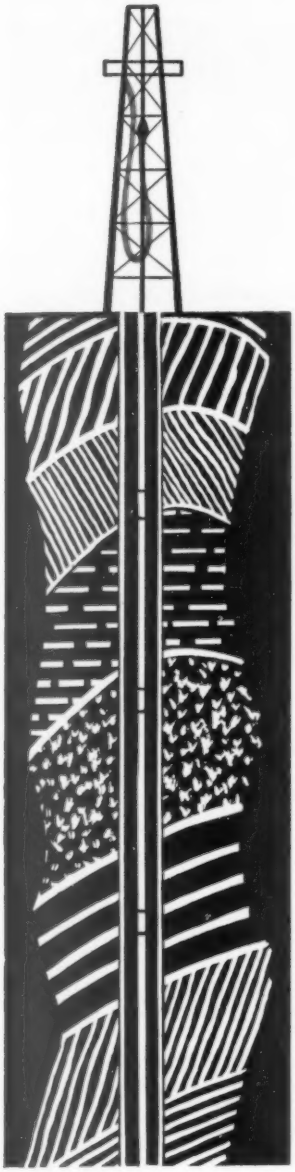
THE TORRINGTON COMPANY

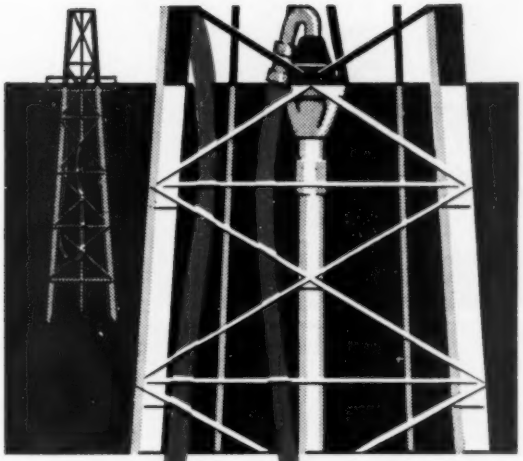
South Bend 21, Ind. Torrington, Conn.

District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON BEARINGS

Spherical Roller • Tapered Roller • Straight Roller • Needle • Ball • Needle Rollers





RAY-MAN ROTARY HOSE

MORE FOOTAGE DRILLED PER DOLLAR INVESTED

Ray-Man Rotary Hose stays with the rig. Features which lengthen the life of Ray-Man Hose add more miles of drilling for every dollar you invest. Oil-proof, gas-proof, and abrasive resistant, the exclusive Flexlastic tube can be used for all methods of drilling. Engineered flexibility in the hose reduces danger of damage and contributes to longer life • The built-in Type "E" Coupling with "Lip-Lok" Pressure Sealing Flange is another R/M feature which adds miles of drilling life to your rotary hose. This coupling has been field tested in every major oil field in the United States . . . and proved SAFE! • Details of Ray-Man Rotary Hose construction may be obtained by writing for Bulletin 6898.

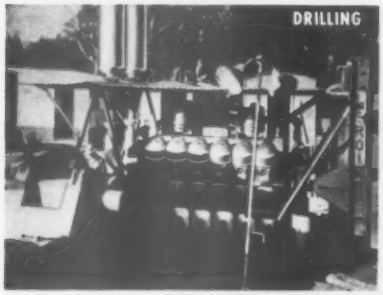
DISTRIBUTED BY NATIONAL SUPPLY COMPANY IN ALL PRINCIPAL OIL FIELDS

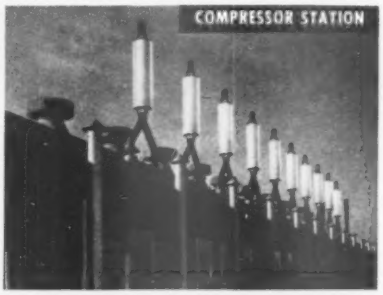
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

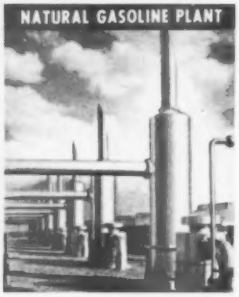
RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

FROM THE WELLHEAD THROUGH THE REFINERY GATE IT'S BURGESS-MANNING



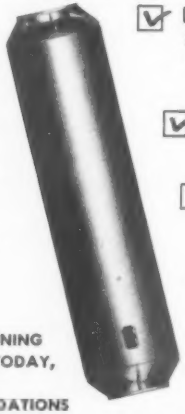




Versatile Engineering Achievement

in the PETROLEUM INDUSTRY

To keep abreast of the changing processes and developments in the petroleum industry, Burgess-Manning has developed new Snubbers for engines, compressors, pumps, and blowers. These Snubbers effectively perform the following functions:



Install BURGESS-MANNING SNUBBERS FOR EFFECTIVELY SOLVING THESE PROBLEMS

Consult BURGESS-MANNING ENGINEERS, TODAY, FOR RECOMMENDATIONS

☑ **Reduce Engine Exhaust Noise**
Snubbers quiet the explosive roar from the exhaust of internal combustion engines . . . the slugs of high energy exhaust gases are effectively dissipated . . . noise reduced to the required level. Combination Air Cleaner Intake Snubbers and Spark Arrester Exhaust Snubbers are also available.

☑ **Reduce Compressor Intake Noise**
The throbbing pulsations of compressor intakes are smoothed to an even continuous flow for quiet operation.

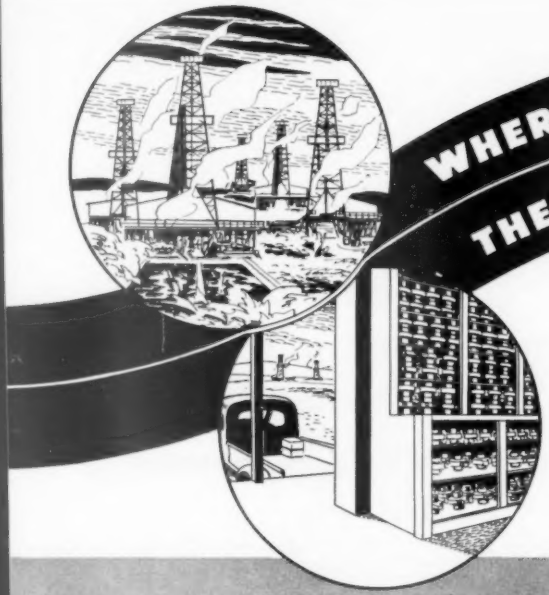
☑ **Provide Surge Control in Gas and Air Piping**
Snubbers prevent the rapid pressure change, which occurs at the compressor or blower, from being transmitted to the pipe line.

☑ **Reduce Pipe Line Vibrations**
Snubbers reduce vibration in all lines due to the intermittent suction or discharge of compressors.

☑ **Provide Accurate Metering**
Snubbers smooth the flow of gas without constriction . . . metering is greatly simplified.

BURGESS-MANNING COMPANY

Chicago — 1203 Dragon Street DALLAS, TEXAS — Libertyville



WHEREVER THERE'S OIL... THERE'S A SUPPLY STORE,

and

WECO UNIONS

FIG 100
1000 p.s.i. TEST
SIZES: 2", 2½", 3", 4", 6", 8"

FIG 600
6000 p.s.i. TEST
SIZES: 1", 1½", 2", 2½", 3", 4"

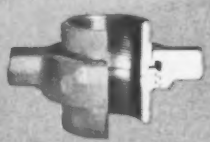


FIG. 200
2000 p.s.i. TEST
SIZES: 1", 1¼", 1½", 2", 2½"
3", 4", 6", 8"

FIG. 602
6000 p.s.i. TEST
SIZES: 1", 1½", 2", 3", 4"

FIG 400
4000 p.s.i. TEST
SIZES: 2", 2½", 3", 4", 5½" O.D.,
6", 7" O.D., 8", 10"

FIG 1502
15,000 p.s.i. TEST
SIZES: 2", 2½", 3"

The MOST COMPLETE LINE OF WING UNIONS IN THE WORLD would naturally have the most complete distribution throughout the oil fields. That's another reason why more and more operators are finding "It's Wise to Standardize with WECO."

Being nearby is one of the great attributes of the supply store. These stalwarts of service and supply are on the job, 'round the clock, every day to provide the busy field man with the equipment he needs. Their stores are stocked with thousands of items for your convenience . . . to save you time and money.

Your nearby supply store knows and stocks the equipment in greatest demand in his locality . . . that's why, with WECO Unions available in sizes 1" through 10" and pressures 1000 to 15,000 p.s.i. test, you will find ample stocks of the sizes and pressures most generally used in your locality, wherever you are.

In addition to the service rendered by supply men, WECO representatives are also at your service in all active fields.

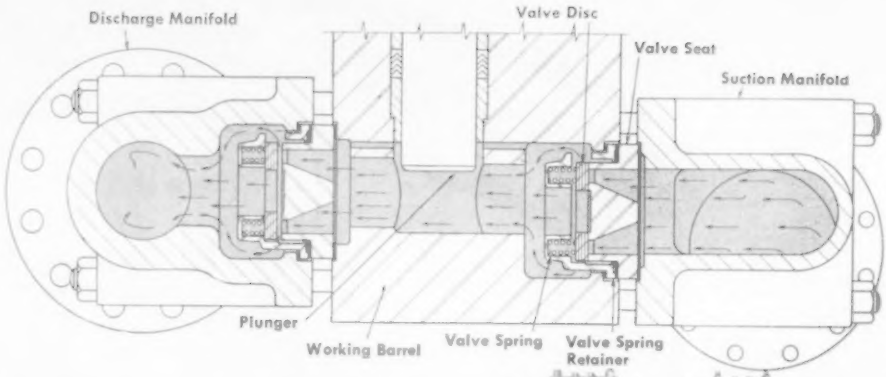
It's Wise to Standardize with... WECO ...

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

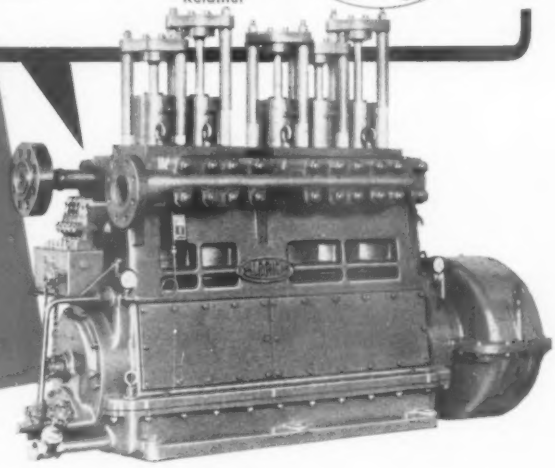
WELL EQUIPMENT MFG. CORP.
Division of Chiksan Company
HOUSTON 1, TEXAS
Exclusive Sales Representative Outside Mid-Continent Area
CHIKSAN COMPANY
Brea, Calif. Chicago 28, Ill. Newark 2, N. J.
Export Sales: CHIKSAN EXPORT COMPANY, Brea, Calif. Newark 2, N. J.

Manufacturers and Distributors of Oilfield, Refining, Marine, and Industrial Equipment

SOLD EXCLUSIVELY THROUGH SUPPLY STORES



ENGINEERS: Check these points of Aldrich Direct Flow Design



Aldrich engineers eliminated two right-angle turns in the fluid-end. Now, liquid passes from suction to discharge manifold in a *straight line.* That gave the Direct Flow Pump its name, and set up a whole new concept of pumps, pumping, and pump maintenance. It all adds up as follows:

☐ **Increased operating speeds**—you get whatever volume and pressure you need *from a smaller, lighter, more compact pump.*

☐ **Sectionalized construction**—parts can be replaced at a fraction of the cost of a new fluid-end; also, parts can be made of stainless, bronze, Monel or other special materials—extremely important for corrosive fluid service.

☐ **Maintenance made easier**—no more tapered bores in the working barrel. Manifolds are *not* taken off but slide out on studs—affording room to *lift out* valves as complete units. Packing is easily renewed—note accessibility of stuffing boxes.

☐ **Interchangeable wearing parts**—available among 3, 5, 7 and 9 plunger pumps of same stroke size. This minimizes spare parts costs and inventories.

☐ **Changeable plunger sizes**—in many cases it is only necessary to add new plungers, glands, throat bushings and packing *to the same fluid-end.*

☐ **Drive direct**—by connection to synchronous engine type motor or internal combustion engine; also with integral speed reducer or V-belts.

Contact your Aldrich Representative . . . or write to us direct for complete details on 3", 5" or 6" stroke units.

THE ALDRICH PUMP COMPANY

9 GORDON STREET • ALLENTOWN, PENNSYLVANIA

...Originators of the Direct Flow Pump

Representatives: P. H. Arden, P. O. Box 185, Glenview, Ill. • Bushnell Controls & Equipment Co., 3929 W. Jefferson Blvd., Los Angeles 16, Calif. • L. T. Gibbs, 509 Petroleum Bldg., Tulsa 3, Okla. • R. B. Moore Supply Co., Inc., Bolivar, N. Y. • Power Specialty Co., 2000 Kipling St., Houston 6, Texas • Reeves & Skinner Machinery Co., 2211 Olive St., St. Louis 3, Mo. Stearns-Roger Manufacturing Co., 1720 California St., Denver 2, Colo. • Export Sales: Petroleum Machinery Corp., 30 Rockefeller Plaza, New York 20, N. Y. • Birmingham • Boston Buffalo • Cincinnati • Cleveland • Detroit • Duluth • Jacksonville • Omaha • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • San Francisco • Seattle • Spokane, Wash. • Syracuse

How Shell Oil does its exploration, drilling, transporting and refining more efficiently with

MOTOROLA 2-WAY RADIO

Motorola 2-way radio is the vital link in offshore drilling operation. Instant communication gets needed supplies, saves time in emergencies.

Central Station Console—the Key Control Point

Conveniently located, easily operated console puts full transmitter power at your finger-tip. Microphone, speaker and clock are placed where you need them for fast dispatching and timed message-handling.

Handie-Talkie® Portable Radiophone

A complete 2-way radio ready for instant action wherever you go. Exploration parties find the *Handie-Talkie* radiophone indispensable. It's a *lightweight* in size, a *heavyweight* in performance.

The widespread operations of Shell Oil Company depend upon Motorola 2-way radio for the fast, reliable communication that reaches key men in every area. Offshore drilling operations, exploration parties and docking facilities are linked together for the co-ordinated action that improves service and protects personnel.

Throughout the Petroleum Industry, Motorola is specified for low overall investment, reduced maintenance cost and top-notch performance. Rough-and-ready Motorola radios take the hardest shocks and jolts, deliver peak performance under all conditions. They're built for the future, too, with obsolescence-proof circuits that guarantee dependable service for years to come.

Motorola

Communications & Electronics Division
4545 Augusta Blvd., Chicago 51, Illinois
Rogers Majestic Electronics Ltd., Toronto, Canada

25 years of

These customers have put A. O. Smith welded steel line pipe into continent-wide service

ARKANSAS & LOUISIANA PIPE LINE CO.
ATLANTIC SEABOARD CORP.
BASIN PIPE LINE
CABOT GAS CORP.
CHICAGO DISTRICT PIPE LINE CO.
CITIES SERVICE
COLUMBIA GAS SYSTEMS SERVICE CORP.
CONTINENTAL OIL CO.
DIXIE GULF GAS CO.
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EL PASO NATURAL GAS CO.
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GULF OIL CO.
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INTERPROVINCIAL PIPE LINE CO.
LAKEHEAD PIPE LINE CO.
LONE STAR GAS CO.
MAGNOLIA GAS CO.
MAGNOLIA PETROLEUM CO.
MEMPHIS NATURAL GAS CO.
MICHIGAN CONSOLIDATED GAS CO.
MICHIGAN GAS STORAGE CO.
MICHIGAN-WISCONSIN PIPE LINE CO.
MID-VALLEY PIPE LINE CO.
MISSISSIPPI RIVER FUEL CORP.
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MOUNTAIN FUEL SUPPLY CO.
NATURAL GAS PIPE LINE CO. OF AMERICA
NORTHERN NATURAL GAS CO.
OHIO FUEL & GAS CO., THE
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PANHANDLE EASTERN PIPE LINE CO.
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SOUTHERN CALIFORNIA GAS CO.
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STANDARD OIL OF CALIFORNIA
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TEXAS EASTERN TRANS. CO.
TEXAS GAS TRANSMISSION CO.
TEXAS-ILLINOIS NATURAL GAS PIPE LINE CO.
TEXOMA NATURAL GAS CO.
TRANS-CONTINENTAL PIPE LINE CORP.
TRANS-MOUNTAIN PIPE LINE
UNITED FUEL GAS CO.
UNITED GAS CO.
UNITED GAS PIPE LINE CO.
WAR EMERGENCY PIPE LINES, INC.
WEST-TEXAS GULF PIPE LINE

A quarter of a century ago, on September 15, 1927, six trainloads—225 cars—of pipe were consigned to the Dixie Gulf Gas Company for their line to run from Waskum to Port Arthur and Houston, Texas, comprising 300 miles of 22-inch and a small mileage of 16-inch pipe.

This is an important date because it marked the start of construction of the first large diameter pipe line made wholly of electrically welded pipe.

Prior to 1927 the entire large diameter line pipe manufacturing capacity of the country was less than three miles per day. With line length and capacity restricted by high cost and limited production, the few existing pipe lines of the day were necessarily of small diameter, serving only the few local markets adjacent to oil and gas fields.

First shipment—Three of the six trainloads of 22-inch welded steel line pipe ready to leave for the Dixie Gulf Gas Co. pipeline project on September 15, 1927.

Then in 1927 A. O. Smith introduced welded pipe in diameters larger than had ever been built before. With this new process, A. O. Smith could weld 40-foot lengths of pipe on a mass-production basis. Hundreds of miles of pipe could be made in a matter of weeks instead of years.

Long distance transportation of gas and oil became a practical economic reality, marking the beginning of the nation's vast pipe line system.

During these 25 years, A. O. Smith has produced and delivered a total of 31,465 miles of line pipe, all of which is in dependable operation in gas and petroleum transmission lines here and abroad.

We pledge a continuing supply in performing our part in our partnership for progress with America's pipe line companies.

pipe line progress

A.O.Smith

LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2 • Los Angeles 22
Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19
San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D. C.
International Division: Milwaukee 1

A. O. SMITH CORP. 78th ANNIVERSARY 1874 · 1952

DEPENDABILITY *through* **RESEARCH** *and* **ENGINEERING**

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8 ⅝-in. to 36-in. diameters.

NEW ALLIS-CHALMERS HD-9, HD-15 ARE built to GET MORE DONE

built to TAKE IT LONGER

UNEQUALLED LUGABILITY

The HD-9 and HD-15 build up greater drawbar pull faster . . . hold it longer than ever thought possible in gear transmission tractors.

For example, when tough going has pulled travel speed down 40 percent, these tractors will have increased their drawbar pull almost 20 percent over rated pull. They will lug down almost 45 percent from rated travel speed before drawbar pull even starts to fall off.

To take full advantage of this important GM 2-cycle diesel engine characteristic, the HD-9 and HD-15 have longer truck frames, lower idlers and sprockets. That means more track on the ground . . . better stability . . . sure-footed traction . . . unequalled *lugability*.

EXTRA LONG LIFE

Here are a few of the many reasons why these newest, finest tractors are *built to take it*.

- **All-Steel Welded Construction**
- **More Power with Bigger Engines — Longer Engine Life**
- **More Weight, Greater Strength**
- **Extra Heavy Main Frames — No Extra Reinforcement Needed for Front-Mounted Equipment**
- **Long-Lasting, Large Diameter Clutches**
- **Double Reduction, Straddle-Mounted Final Drive Gears with Live Sprocket Shafts and Caged Bearings**
- **Positive Operating Track Release — Works in Oil**
- **All New, Specially Designed Track Assembly**
- **Positive-Seal Truck Wheels, Support Rollers and Idlers; Mounted on Tapered Roller Bearings, 1,000-Hour Lubrication!**

Your Allis-Chalmers dealer will be glad to explain all of these advantages. See him or phone him now.

THE NEWEST, FINEST LINE ON EARTH!

40 drawbar hp.
11,250 lb.

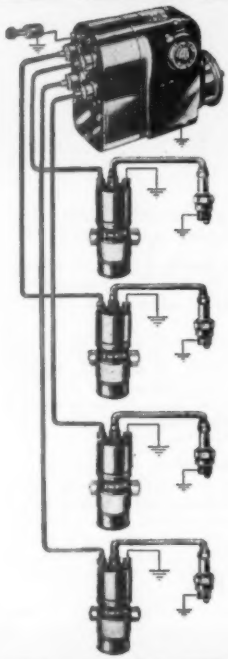
72 drawbar hp.
18,800 lb.

109 drawbar hp.
27,850 lb.

Hydraulic Torque Converter Drive
175 net engine hp.
41,000 lb.

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.



for Large Bore, Stationary Gas Engines

AMERICAN BOSCH

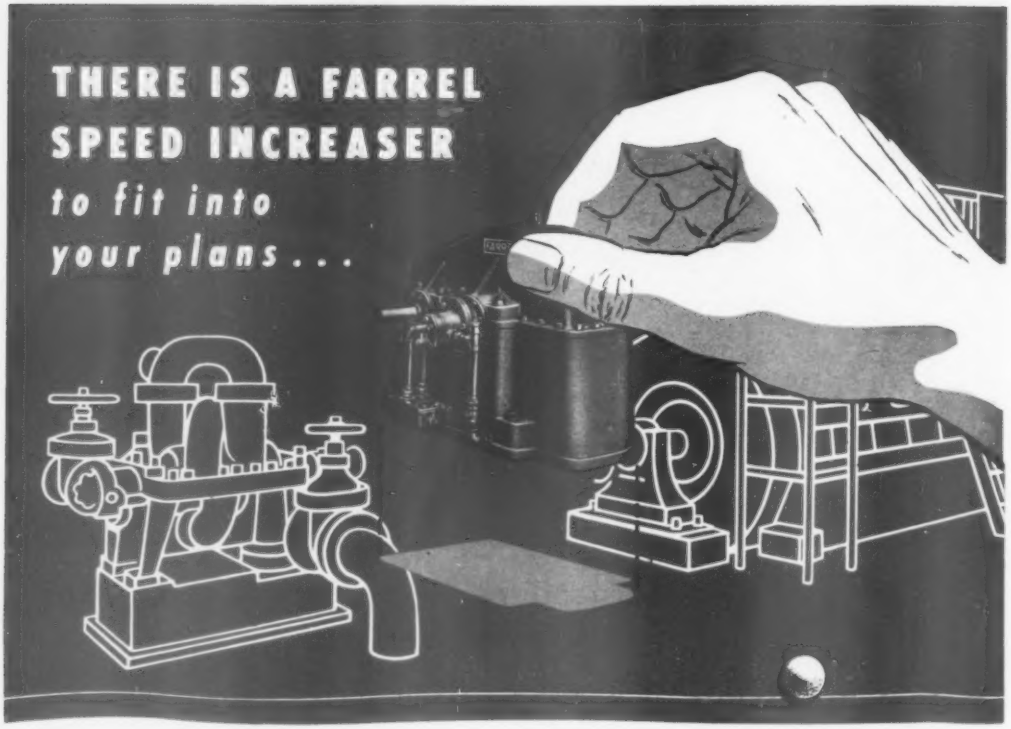
LOW TENSION MAGNETO IGNITION SYSTEM

The System comprises the American Bosch MRB Low Tension, shielded Magneto and individual High Tension Ignition Transformers mounted at each engine cylinder. (See 4 cyl. installation diagram at left). Low tension current, generated in the Magneto, is distributed through low tension leads to the Transformers. Here, the electrical energy is stepped-up to high voltage and conducted to the spark plugs by short cables—shielded if desired. The rugged, heavy-duty, high tension Transformers (as illustrated above) are available with or without shielding for use in the American Bosch System or other low tension systems employing magneto or battery ignition.

Energy losses and corona effects which occur with long high tension cables are eliminated. The possibility of fire and explosion hazard is minimized where engines operate in combustible vapors . . . radio and TV interference may be greatly reduced by complete shielding. These important advantages, combined with the outstanding electrical and mechanical features of the American Bosch Low Tension Magneto, offer maximum spark efficiency for engines operating under severest conditions. Write for the facts and we'll show you how you can get this peak performance and safer, continuous service with your present equipment. American Bosch Corporation, Springfield 7, Mass.

AMERICAN BOSCH

THERE IS A FARREL SPEED INCREASER *to fit into your plans . . .*



Farrel Type SI units were the first speed increasers to be developed in a standard series for pipeline pumping service. That was twenty years ago, and all of the original units, as well as those installed since, are still in operation.

The modern SI line consists of 49 standard sizes with speed ratios ranging from 1:1 to 12:1. For higher ratios, units using two sets of gears are supplied with ratio range from 12:1 to 40:1. Two-pinion units, designed to transmit power from a single engine to two pumps are also available.

When requirements fall between the range of Type SI units and standard commercial speed reducers, Farrel semi-high speed units are recommended.

These units are designed for pinion speeds up to 3600 RPM and gear pitch line velocities up to 4000 FPM.

Farrel engineers will be glad to help you select the right gear unit for your high-speed application. Write for further information about any of the types mentioned.

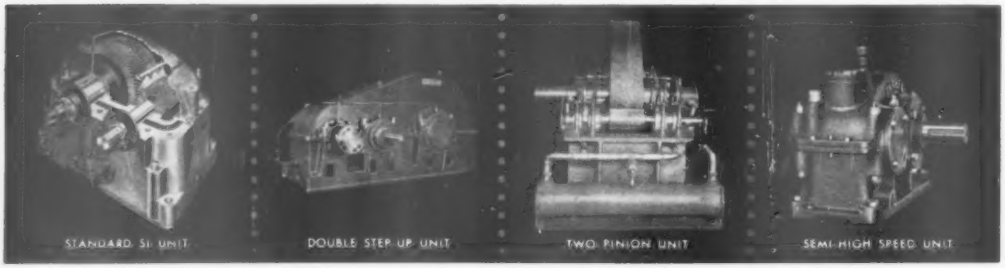
FARREL-BIRMINGHAM COMPANY, INC. • ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, New Orleans

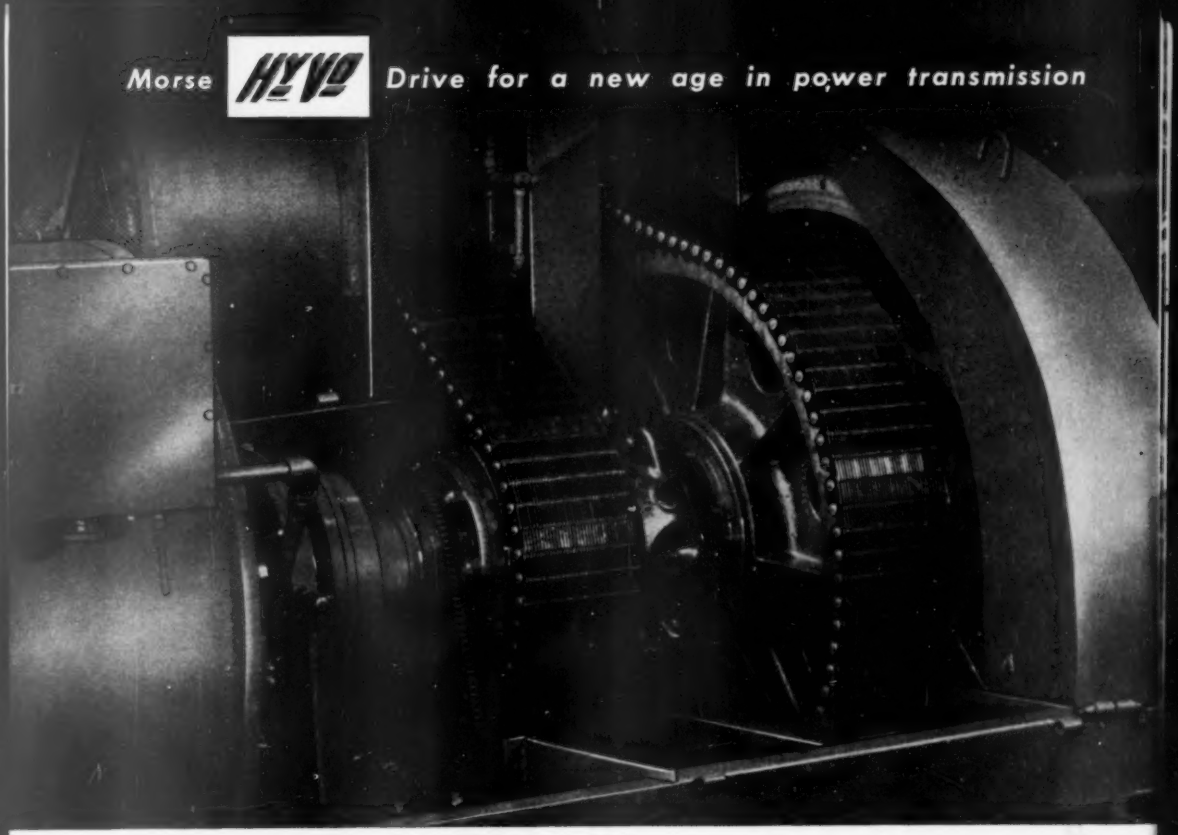
OIL FIELD REPRESENTATIVES:
Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.
V. W. Osborne, 860-A M&M Building, Houston 2, Texas

Farrel-Birmingham®

FB-747



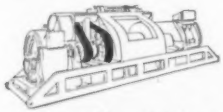
Morse **HY-VO** Drive for a new age in power transmission



Now, more horsepower, greater speed plus portability

possible for first time in oil field drawworks

Once, oil field drawworks powerful enough to drill 20,000-foot holes had the portability of small apartment buildings; had to be knocked down, trucked piecemeal from hole to hole site, and re-assembled. Very costly.



Now, the *portable* model shown above supplies 1500 HP at 600 RPM. And just two 2"-pitch by 12"-wide Hy-Vo Drives transmit its power. The Hy-Vo Drives operate at twice the speed with three times the load considered practical for conventional chain drives. Hy-Vo made this revolutionary, cost-slashing oil field development possible—and portable.

What Hy-Vo can do for you

A Morse Hy-Vo Drive will transmit more horsepower at higher speeds and lower cost than any other drive ever known. It opens the way to transmitting more horsepower from smaller, less expensive high-speed engines—without costly accessories.

Remarkable as it is, Hy-Vo is still only one of a complete line of power transmission products that has made the name Morse synonymous with exceptional engineering, exceptional quality, exceptional performance.

Write today for Hy-Vo Catalog C 72-51 —or for information on Morse Silent Chain or Roller Chain Drives, Morse Flexible Couplings, Morse Drive Shafts, or Morse Clutches. (Hy-Vo orders must carry priority rating at present time.)

More than ever, M = PT—Morse means Power Transmission.

MORSE CHAIN COMPANY • Dept. 385 • 7601 Central Ave. • Detroit 10, Mich.

Branch offices serving the petroleum industry: Houston, Texas, 1312 LaBranch Avenue, P.O. Box 896; Pasadena, California, 1571 Harding Avenue; Pittsburgh, Pennsylvania, 503 Martin Building

MORSE
MECHANICAL
POWER TRANSMISSION
PRODUCTS

PRODUCTS OF B-W BORG-WARNER

50-TON HAULS with WAUKESHA *Diesel*

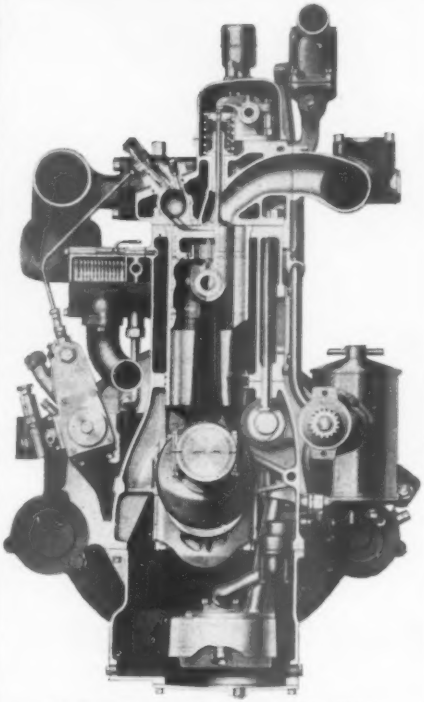
Packed with Power to Pull Heavy Oil Field Machinery

Here's another great Waukesha Oil Field Diesel! It's putting out peak payload performance, hauling heavy oil field machinery . . . as high as 100,000 lb. gross weight . . . for Crail Transportation Co., Long Beach, California. As their president and general manager, Mr. A. W. Swanson says, "This engine has been satisfactory in every way, and has met all our requirements fully."

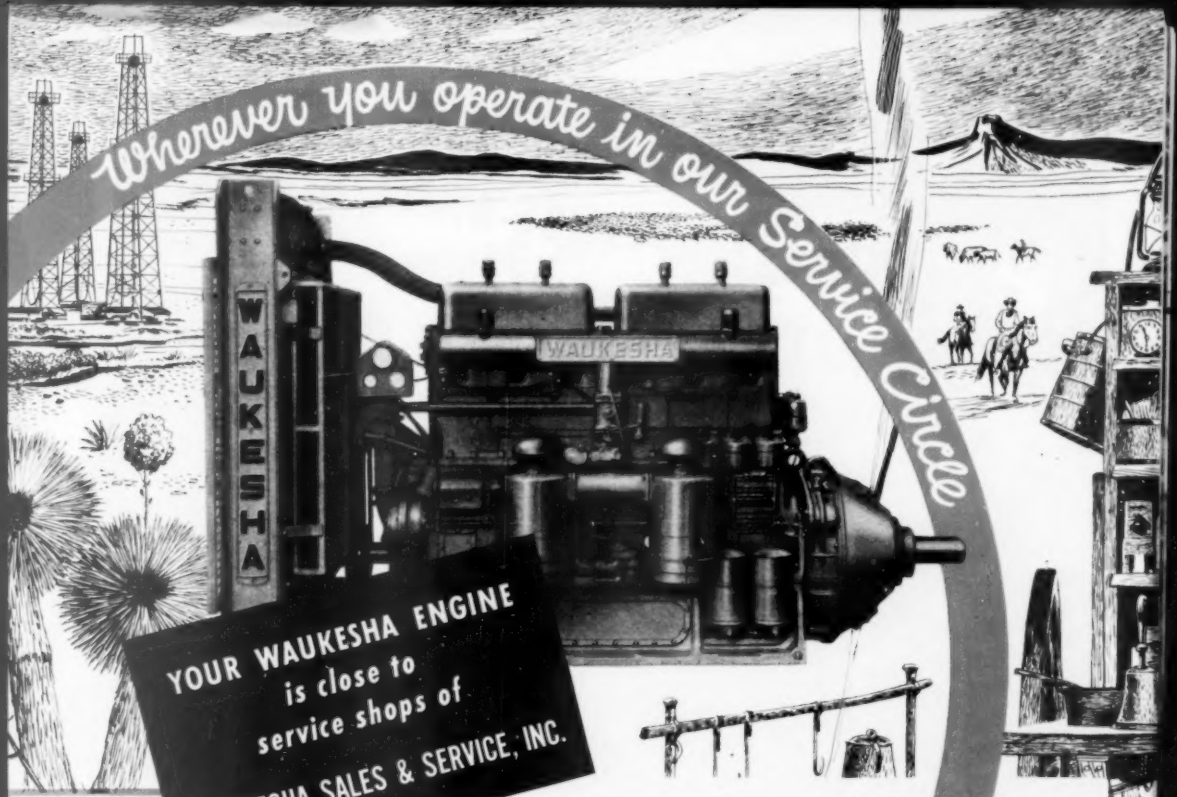
Like all Waukesha Oil Field Diesels, Model 148-DK has the patented spherical combustion chamber, for clean burning, lively acceleration, shock-free operation, high fuel economy, and low upkeep; and many other exclusive features told in Bulletin 1532.

For every oil field service—Waukesha engines and power units—Diesel, natural gas, butane or gasoline; 10 hp to over 500 hp. Get Bulletin 1079. 188

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES



WAUKESHA High-Duty DIESEL Model 148-DK six-cylinders, 5¼-in. bore x 6-in. stroke, 779 cu. in. displacement. Peak hp 200.



We maintain complete overhaul facilities in each shop and Field Service men are available. So, when you need service on your Waukesha engines, remember

YOUR WAUKESHA ENGINE IS TREATED BEST AT HOME!

Legend

- Branch Stores with Service Facilities
- Sales Offices

WAUKESHA

SALES & SERVICE, INC.

1422 MAURY STREET • HOUSTON, TEXAS

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND NEW MEXICO

THIS YOUNG TUBE-AND-FIN
CORE PAYS A BONUS!
● PERMANENT, PERFECT BOND BETWEEN TUBES AND FINS
● GREATER HEAT TRANSFER EFFICIENCY
This die-formed collar provides a tight, permanent bond along entire length of tube, as shown in cross section at left.

Here's why Young-designed and built tube and plate fin cores give greater heat transfer efficiency . . . stand up better under peak capacity operation . . . pay bigger dividends in longer trouble-free service. The outstanding design and construction of the Young plate type fin core, shown above, features specially die-formed reinforced collars which make a continuous, *permanent* bond between fins and tubes . . . providing maximum heat transfer and greatly stronger, longer-lasting cores.

This mechanical structure of greater strength which permits the use of the most desirable metals chosen for the job — copper, aluminum or other alloys — is attributable to Young's precision-manufactured, high-quality cores.

Whatever your need, consult your nearest Young Sales Representative to help you select correct cores — types and sizes — and discuss any phase of your heat transfer problems.

OIL FIELD REPRESENTATIVES:
TULSA: J. R. Meek Company, 1341 S. Boston St., Rm. 109
LOS ANGELES: Flournoy & Everett, Inc., 5043 Santa Fe Ave.
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Other Representatives in Principal Cities

One of our many important installations is the Reynolds Metals Company's new San Patricio, Texas plant which uses more than 80 Young units featuring the new "bonus" core for cooling engine jacket water and lube oil, and 91 additional units of Young variated, specially designed construction.

1927 · 1952
25 YEARS OF PROGRESS

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY

Dept. 202-J • RACINE, WISCONSIN
Factories at Racine, Wisconsin and Mattoon, Illinois

- One-piece Connecting Rod, heat-treated alloy casting—eliminates bolt failure.
- Exclusive Eccentric construction with large Bronze Bearings on rigid hardened main shaft—the right bearing for heavy reciprocating loads.
- Continuous tooth Herringbone gear and pinion—quiet, durable, efficient.
- Liners packed against fluid leakage—"tell-tale" construction permits quick discovery of any liner packing leakage.
- Rigid Main Shaft—a sturdy crossmember assures perfect alignment.
- Oil-stop head keeps oil in, keeps mud and water out of power end.
- Mud-stop head prevents fluid leaking from stuffing boxes and getting into crankcase.

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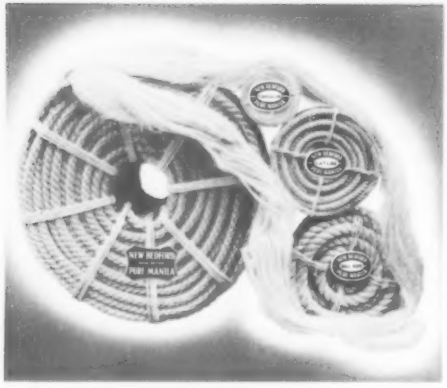
Endurance!



TIME—TESTED

New Bedford Cordage

HAS PROVED PERFORMANCE

Made from the highest grade manila fibre obtainable . . . with the most modern and scientific methods applied to its processing. . . . New Bedford Pure Manila Cordage has proved its dependability for nearly a century.

For Cat Lines . . . Bull Rope . . . Drilling Cable . . . Torpedo Lines . . . Plain Laid Rope . . . Spinning Lines . . . specify New Bedford — "there's none better."

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Aeroquip

REG. TRADE MARK

BRANCHING OUT!

The seed was planted only 12 years ago but the idea grew and grew. New Aeroquip products serve dozens of major industries with a multitude of applications.

Originally, Aeroquip produced Flexible Hose Lines and Self-Sealing Couplings for military aircraft only. Successive developments, which actually set the pace for military standards, led to Aeroquip's present position of dominance in the fields of commercial as well as military aircraft.

The development of allied industrial products presented vast new opportunities. The "Aeroquip Idea"—bulk hose that can be cut to length and detachable, reusable fittings which can be easily assembled by hand—flourished among manufacturers and users of all types of industrial equipment. Even the farmer is counted among Aeroquip's customers.

Today, Aeroquip produces and sells more hose lines for industrial and aircraft applications than any other manufacturer.

AEROQUIP CORPORATION, JACKSON, MICHIGAN

SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA. MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

WELDING FITTINGS ON YOUR MIND

It will pay you to think of Midwest whenever you think of welding fittings. For example: the variety of elbows offered only by Midwest provides greater latitude in piping design and permits improvements and economies not otherwise possible.

MIDWEST "LONG TANGENT"

Same radius as ASA but tangent equal to 25% of nominal pipe size on each end. Saves pipe, layout and welding time. Costs no more than ASA. Sizes to 24".

ASA STANDARD

Dimensions conform to applicable size range of American Standard for Butt-Welding Fittings, ASA B16.9. Tolerances much less than allowable. Sizes to 26".

SHORT RADIUS

Recommended where space limitations do not permit use of "Long Tangent" or ASA Elbows. Sizes to 30".

MIDWEST REDUCING

Takes the place of a straight size elbow and a reducer. Eliminates one weld, reduces pressure drop, easier to insulate. Sizes to 12", reductions to half size.

4580

MIDWEST

PIPING & SUPPLY CO., Inc.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices: New York 7—50 Church St. • Chicago 3—79 West Monroe St.
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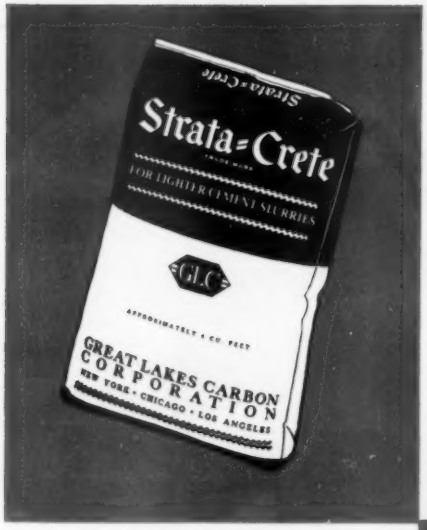
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

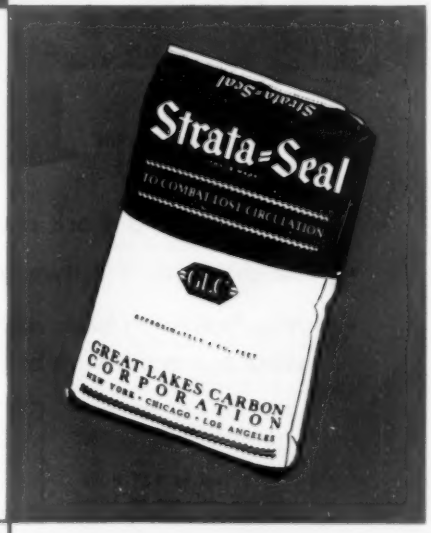
well-proved

ability to solve drilling problems...



Strata-Crete
TRADE MARK

—the aggregate which provides lighter cement slurries with *excellent bridging qualities*



Strata-Seal
TRADE MARK

—the mud additive with *excellent bridging effect* for restoring lost circulation

Lightweight STRATA-CRETE aggregate cuts down weight of cement slurries. It permits higher columns at lower pressures... bars loss of slurry... resists cracking or shattering on perforation.

Consistent performance in well after well gives *proof* that STRATA-SEAL is a superior lost circulation material. It is chemically inert and unaffected by mud or heat.

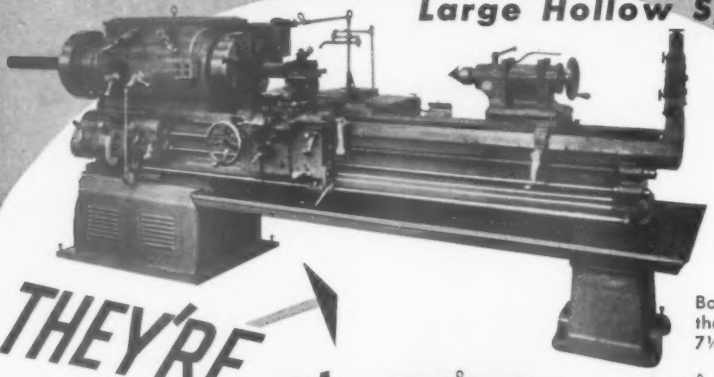
GREAT LAKES CORPORATION
a subsidiary of
GREAT LAKES CARBON CORPORATION
5845 Atlantic Ave., Long Beach 5, Calif.
Offices in Principal Oil Centers

Packed in 4 cu. ft. bags.
Available through Leading Oil Well Cementing Concerns; Leading Mud Service Companies.
Write for more data.

FOR FASTER PRODUCTION, BETTER WORK, LOWER COSTS—

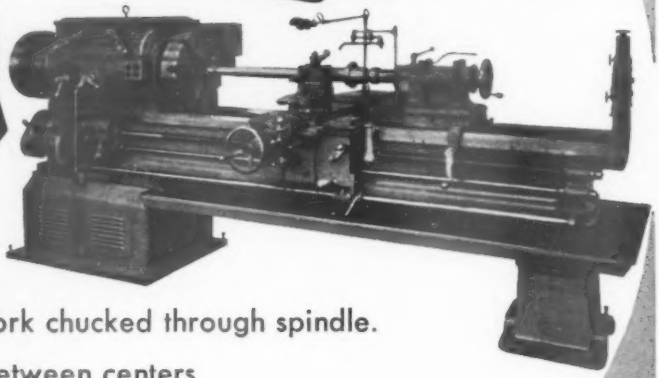
HYDRATROL LATHES

Large Hollow Spindle Type



Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

THEY'RE VERSATILE!



- Machine long work chucked through spindle.
- Machine work between centers.
- Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

SIZES 18" TO 36"

Small — 18" & 20" up to 7⅛" Hole
Medium — 25" up to 12" Hole
Large — 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")

IMPORTANT FEATURES

Timken Bearing Spindles.

Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

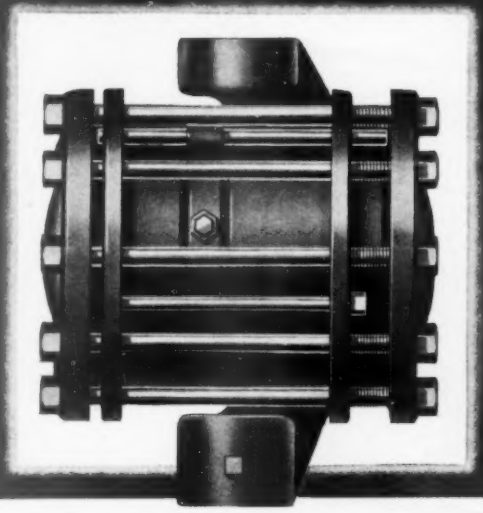
Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

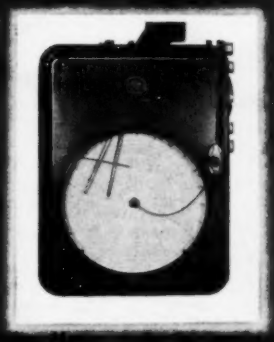
LEHMANN MACHINE COMPANY

CHOUTEAU AT GRAND • SAINT LOUIS 3, MISSOURI

Now AMERICAN® offers...

THE *NEW* MERCURYLESS ORIFICE METERS





- ONE PIECE STAINLESS STEEL BELLOWS—minimizes metal fatigue for long service life.
- DIRECT FULL SCALE RECORDING PEN MOVEMENT—no external gearing or linkage multiplication.
- STAINLESS STEEL INTERNAL PARTS—and Monel metal stuffing box shaft for corrosion resistance.
- AMERICAN TYPE "B" TEFLON SEAL STUFFING BOX—no lubrication, no shaft freezing, no leaks.
- STICK PROOF CHECK VALVES—protect bellows against over-range damage or distortion.
- SIMPLIFIED RANGE CHANGE—no disconnecting manifolds.
- EASY CALIBRATION AND CLEANING—by simply removing one or both case cover heads.

NO PRECISE LEVELLING OR SEAL POTS REQUIRED.

FOR PEDESTAL, PANEL OR OVERHEAD MOUNTING—TOP OR BOTTOM GAUGE LINE CONNECTIONS.

Dri-Flo Meters are the latest addition to the American line—developed under the Company's century-old tradition of "Sustained Accuracy at Lower Cost."

Write for Specifications

AMERICAN METER COMPANY
INCORPORATED ESTABLISHED 1892

AMERICAN METER CO
EST. 1892
MEASUREMENT ENGINEERS

GENERAL SALES OFFICE:
1513 Race Street, Philadelphia
Albany • Alhambra • Atlanta • Baltimore
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Meter Co., Ltd., Hamilton, Ont. • Edmonton, Alb.

How's This For Picking 'Em Up and Laying 'Em Down!

(Quoted from an unsolicited letter)

Unibolt Couplings. About a year and a half ago I purchased three miles of 2-inch line pipe to be used as a water line. This line has to be taken up and moved from location to location so I decided to equip this pipe with your Unibolt Couplings.

A three-man pipe line crew will "couple up" three miles of this line in an eight-hour working day, providing the country is not unusually rough. Two men make up the coupling and start the nut on the bolt while the third man follows up using a long handled speed wrench to set up the coupling nut. A crew of four men, two working from each end of the line, will uncouple the three miles in 3-1/2 hours. These men run the nuts on the bolts all the way, making them finger tight so they will not be lost on the next move. There is practically no upkeep on this line, requiring but a few bolts and gaskets once in a while. Three men recently laid 7,000 feet of this line in three hours and four men took up the same amount in one hour.

In using the screw-end pipe it took five men, using three sets of pipe tongs, to make the pipe line crew, and doing some repair work such as cutting new threads, knocking "dutchmen" out of the collars, etc., took three days to lay three miles of pipe. They had to carry in their car three sets of pipe tongs, pipe cutoffs, stock and dies, hammer, chisel, diamond point, a 36" and a 24" pipe wrench, large oil can, pipe thread dope, and extra 2" collars. Using the pipe equipped with Unibolt Couplings required them to carry only a light ball pein hammer and two light, long-handled [illegible]

Unibolt Malleable Couplings are ideal for water lines, tank batteries, fuel lines, and similar low pressure service. They are easy to assemble, inexpensive, and require practically no upkeep. A replaceable, long-life, resilient seat ring assures a tight seat even after frequent dismantling, rough handling, and on misaligned pipe.

These Couplings are also furnished with a tongue and groove type seat which, of course, provides a stiff joint and will not permit coupling of misaligned pipe.

THORNHILL-CRAVER COMPANY

P. O. BOX 1184 HOUSTON, TEXAS

P&H Diesel Engines

(2-CYCLE)

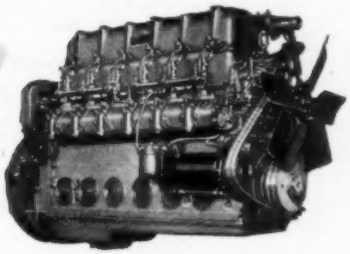
Do your diesels control temperature in this critical area?

Note the arrangement of intake ports on this unit cylinder head and liner assembly for a P&H Diesel. This entire area, including the spaces between ports, is fully water-jacketed to insure uniform cooling. No other 2-cycle diesel in this horsepower range controls temperatures throughout the entire stroke of the pistons!

What does this mean to you? Lower temperatures give you greater protection against wear and tear — against parting of metals — against maintenance, repair and replacement problems.

This is only one of many advantages you'll find in the advanced line of P&H Diesel Engines. They're available in 1, 2, 3, 4 and 6-cylinder models — from 20 to 138 h.p. Ask your nearest P&H Diesel representative for full details. Or write us.

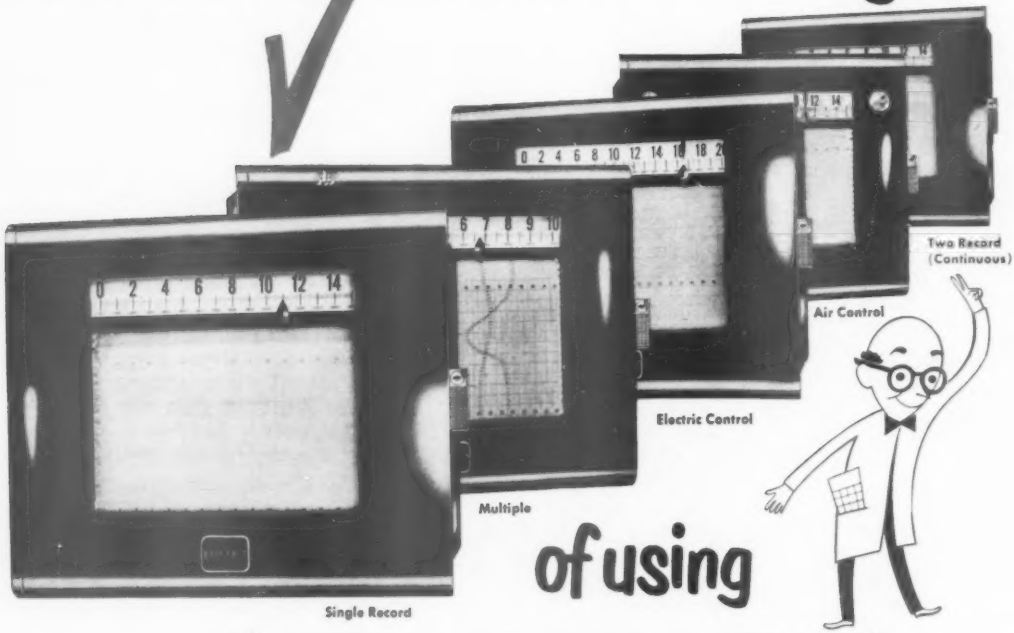
P&H DIESEL DIVISION
HARNISCHFEGER CORPORATION
CRYSTAL LAKE, ILLINOIS



the P&H *Line*

TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PRE-FABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

CHECK the Advantages



# of using the Dynamaster Family

of continuous-balance electronic instruments

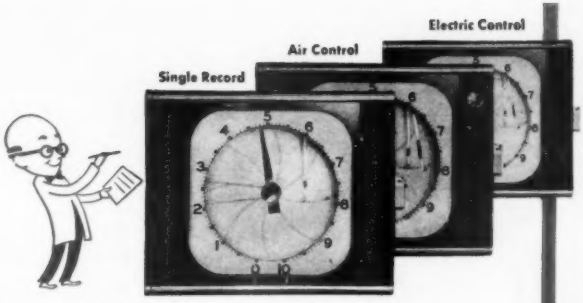
Strip chart or circular chart recorders . . . recorders with slow or fast pen speeds and chart speeds . . . single or multiple recorders . . . automatic controllers . . . all in the same case with identical components except the chart-drive mechanisms.

This variety-with-standardization assures you of easier installation, better looking control panels, simpler maintenance. The service man who knows one Dynamaster, knows them all.

BRISTOL

The dependable Guidepost of Industry

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



"Everyone who sees these Dynamasters is impressed with clean simplicity of internal design."

You'll be impressed too

WITH FEATURES LIKE THESE:

Models to measure any variable convertible into d-c voltage, d-c current, resistance, capacitance

Continuous-balancing electronic circuit assures instant response

All types of electric and air-operated controllers offered

Little or no maintenance

All models use the same easy-to-replace components

Electronic unit uses vacuum tubes available at any radio supply house

Full-scale pen travel of 7, 3 or ⅔ seconds

Chart speeds from ¾ in. per hour to 7200 in. per hour.

Multiple recorders up to 16 points

Practically immune to vibration, shock, or external stray currents

YOU'LL WANT TO GET *full details by using the coupon to order Catalog No. P1245.*

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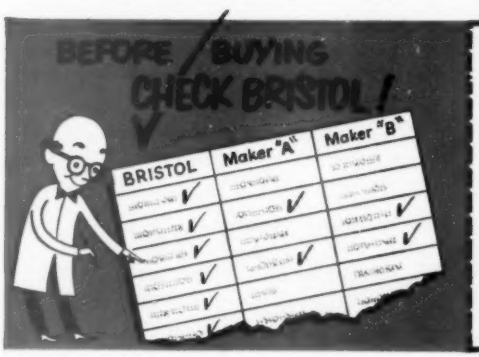


THE BRISTOL COMPANY
120 Bristol Road
Waterbury 20, Conn.

Please send catalog giving details of Dynamaster performance to:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

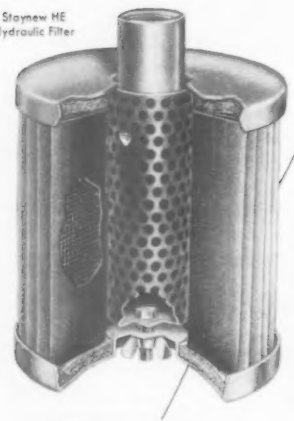
CITY _____ ZONE _____ STATE _____

INSTALL STAYNEW HYDRAULIC AND BREATHER FILTERS

As Original Equipment on Your Hydraulic Machinery

Fit the filtering requirements of your hydraulic machinery to your specific needs by installing Staynew Hydraulic and Breather Filters.

Staynew HE Hydraulic Filter



Staynew BR Breather Filter

DOLLINGER PROTECTIONIZED STAYNEW FILTERS

HYDRAULIC FILTERS

Compact, simplified filters for use wherever dirty liquids are collected, filtered or recirculated. Wide range of metallic mesh and fabric media are available. Long operation assured without cleaning or replacement.

BREATHER FILTERS

Permit practically constant interior pressure by allowing atmospheric air to be drawn in or exhausted as required—while preventing entrance of impurities and escape of liquid mist or fog.

When you build this perfect combination into your hydraulic machinery, you'll save costly equipment wear, spoilage, and maintenance time.

Let our Engineering Department solve your hydraulic filtration problems. Write today for Bulletin HF-2.

Representatives in Principal Cities

DOLLINGER CORPORATION, 5 Centre Pk., Rochester 3,, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

THESE OIL-INDUSTRY STEEL VALVES

Keep Line Pressures High-- Reduce Turbulence

These Lunkenheimer 150 lb. Steel Gate Valves feature smooth interiors and full-rising discs to help you maintain constant pressures by reducing turbulence.

You'll find eleven other advanced design features in these valves—more than in any other steel valve of the same class. See your local Lunkenheimer representative for details.

WRITE FOR

"Lunkenheimer Cast Steels," a 52-page brochure which will help you select the *right* steel valve for any application. Request Circular 506 from The Lunkenheimer Co., Box 360F, Cincinnati 14, O.

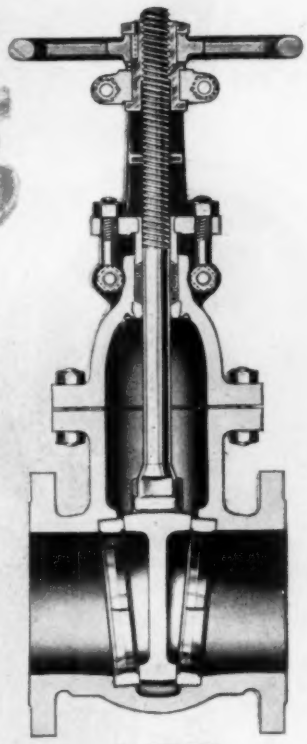


Fig. 1751 WB2
Oil Service

STEEL • IRON • BRONZE

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

Get clean cut threads

EVERY TIME with TOLEDO

No. 00, Ratchet
⅛" to ¾" pipe

SAVE LABOR . . . CUT COSTS

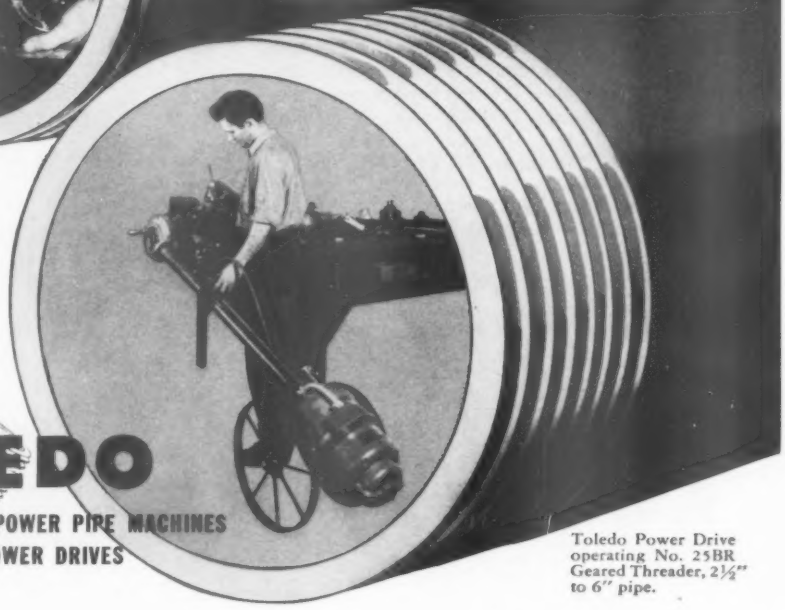
Advanced features throughout the line of Toledo Pipe Tools and Power Pipe Machines help you do the job right!

★ *Better workmanship* . . . you can depend on Toledos to produce smooth, clean-cut threads . . . assuring trouble-free jobs and all-around satisfaction.

★ *Faster production* . . . whether it's hand tools or power, you'll find Toledos unbeatable for easy cutting and easy handling. All Toledos designed to speed the work. Especially you'll like Toledo Power Drives to operate the large geared tools . . . Toledo Power Pipe Machines for pipe up to 4".

★ *Lower costs* . . . you can use the finest—Toledo Tools—and be ahead in economy, because of the extra long life and low maintenance with Toledo dependability. Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

No. 12, Ratchet
½" to 2" pipe



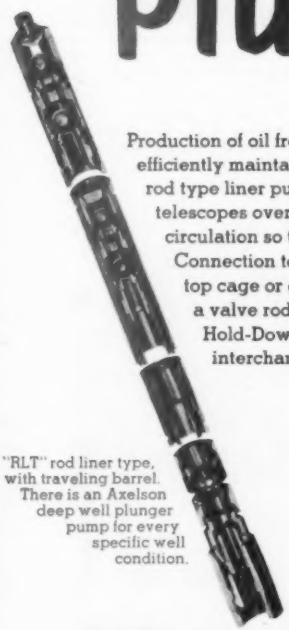
Toledo Power Drive operating No. 25BR Geared Threader, 2½" to 6" pipe.

50 YEARS OF LEADERSHIP

TOLEDO

PIPE TOOLS . . . POWER PIPE MACHINES
. . . POWER DRIVES

"You can't beat an Axelson Deep Well Plunger Pump"



"RLT" rod liner type, with traveling barrel. There is an Axelson deep well plunger pump for every specific well condition.

Production of oil from wells having sandy conditions is efficiently maintained by the use of Axelson traveling barrel rod type liner pumps. The external barrel assembly telescopes over the plunger unit, keeping the fluid in constant circulation so that hazards of sanding up are minimized. Connection to the sucker rod string is made directly to the top cage or guide coupling, eliminating the necessity of a valve rod. The Axelson Bottom-Lock Mechanical Hold-Down conforms to API specifications. All parts are interchangeable. **Chosen first . . . to last!**

AXELSON
PETROLEUM PUMPING EQUIPMENT

OUR 65th YEAR

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON MANUFACTURING CO. • PLANTS—Los Angeles 58, Calif.; St. Louis 16, Missouri. OFFICES—New York City 7, New York; Tulsa 1, Oklahoma; Buenos Aires, Argentina. DISTRIBUTORS — Jones & Laughlin Supply Co.; Great Northern Tool & Supply Co.; Industrial Agencies, Ltd., San Fernando, Trinidad, B. W. I.; Industrias Waldrip & Campbell, Barcelona, Caracas and Maracaibo, Venezuela; South American Supply Co., Ltd., Lima, Peru; Sociedad Comercial de Materias Primas Limitado, Rio de Janeiro, Brazil; G. Saavedra e Hijos, S. de R. L. Avenida Morelos 31, Mexico, D. F.; Dominion Oil Field Supply Co., Ltd., Calgary, Canada.

Tenamene

the most effective additives known . . . keep gasoline cleaner . . . longer . . . at low cost

WHAT IS GUM? Gum is a non-volatile material resembling varnish or lacquer. Soluble in gasoline, gum separates only when gasoline evaporates, unless highly concentrated. Sometimes gum settles as a heavy, dark-brown oil. The enemy of engine efficiency, gum coats carburetors, plugs jets and screens, and causes valves to stick.

WHAT INHIBITORS DO. Commercial gasoline inhibitors retard oxidative deterioration, the first step in gum formation. To prevent storage loss, inhibitors should be soluble in gasoline but not in water. They should not color gasoline and should resist darkening.

THE TENAMENES — EASTMAN INHIBITORS. For years Eastman has made the most effective gum inhibitors known—Tenamene 1 and Tenamene 2. Formerly these were sold through another company under another name. Now Eastman makes them available directly and from convenient stocks. Choice between the two gum inhibitors depends on a number of factors, such as the crude, the treatment and possible caustic carryover. Tenamene 2 should be used where traces of caustic are present. Where caustic is not present, choice must be based on such tests as ASTM Gum, Oxygen Bomb or Copper-dish Gum. Since Tenamene 2 is more concentrated and non-inflammable, its slightly higher cost is frequently more than offset by lower shipping costs.

FOR MOTOR FUELS. Tenamene 1 is a mobile, tan liquid composed of 48% N-n-butyl p-aminophenol in isopropanol. 5 to 52 lbs. per 1000 bbls. inhibit gum in most motor fuels, protect dyes from fading, and retard tetraethyl lead decomposition.

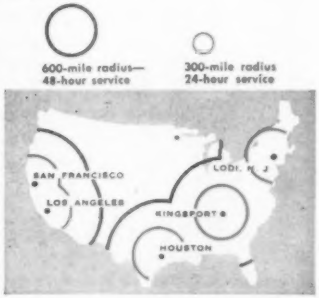
FOR MOTOR FUELS AND ALL AVIATION GASOLINES. Tenamene 2 is a mobile tan-to-red liquid comprising N,N'-di-sec-butyl p-phenylenediamine. For motor fuels generally, 2.6 to 26 lbs. per 1000 bbls. are used. Tenamene 2 has been thoroughly tested in aviation gasolines and approved for military purposes. It is highly resistant to extraction by water and caustic solutions. In hot, humid climates Tenamene 2 greatly retards deterioration of aviation gasoline that results in lead deposits. The maximum concentration allowable in aviation gasolines (8.4 lbs. per 1000 bbls.) should be added.

FOR COPPER CONTAMINATION. Tenamene 60, third member of the Tenamenes, is a mobile, red liquid composed of 80% disalicylal propylene di-imine in toluene. Traces of copper are often found in gasoline—from treating processes or from copper equipment employed during production, storage or use. Tenamene 60 overcomes the catalytic effect of copper on the oxidation stability of gasoline.

TESTS PROVE TENAMENE EFFECTIVE. Various tests with all types of gasoline proved the effectiveness of the Tenamenes. Uninhibited gasoline deteriorated rapidly in storage, forming considerable gum. Tenamene stabilized gasoline formed little gum in prolonged storage. Tennessee Eastman will be glad to make these analyses on any refiner's gasoline.

HOW TO USE TENAMENE. In general, unrefined cracked gasoline should be treated with Tenamene promptly after condensation. Refined gasoline should be treated as it is pumped to storage. If delay is necessary, add small amounts initially, the balance later. Tenamenes can be added in concentration, but are better added as dilute stock solutions since small quantities are generally involved. Common procedures are the proportioning pump, eductor or gas-pressure method. Tenamene 1 and 2 should be protected from air to prevent discoloration. Tenamene 60, however, does not need inert atmosphere for application.

WHERE CAN YOU GET TENAMENE? Eastman can give top service on your requirements of these excellent additives. Stocks of Tenamene are carried at five convenient locations. A glance at the map below shows delivery schedules. Write to one of our sales representatives* or to Kingsport, Tennessee for prices, specifications, and other information.



Tenamene

EASTMAN GASOLINE ADDITIVES

SALES REPRESENTATIVES: New York—260 Madison Ave.; Framingham, Mass.—7 Hollis St.; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **West Coast: Wilson Meyer Co.,** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave.; Seattle—821 Second Ave.

Advance-Design

CHEVROLET TRUCKS

These PLAIN HARD FACTS are important to economy-minded truck buyers

first in demand
in value
in sales

CHEVROLET

Fact No. 1

CHEVROLETS LIST FOR LESS

First cost—the list price—is less for a Chevrolet than for any comparable truck capable of handling the same payload. Chevrolet's position as the world's largest manufacturer of trucks makes possible production savings that are passed on to you.

Fact No. 2

COST LESS ON THE JOB

Proved Chevrolet truck features save money over thousands of miles. Time-tested Valve-in-Head engines, rugged hypoid rear axles, extra-sturdy channel-type frames, Flexi-Mounted cabs, Ball-Gear steering, Synchro-Mesh transmissions, all contribute to low operating costs with high dependability.

Fact No. 3

EACH TRUCK TAILORED TO ITS JOB

Every Chevrolet truck is *factory-matched* to the job it's going to do. Tires, axles, frame, springs, engine, transmission, and brakes are right for the operating conditions and load. Whatever your job is, there's a Chevrolet truck to fit it.

Fact No. 4

WORTH MORE AT TRADE-IN TIME

Chevrolet trucks traditionally bring more at resale than other makes costing about the same when new. Chevrolet trucks keep their value longer and give you real, substantial savings right up to the day you sell them. See your Chevrolet dealer soon.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load • POWER-JET CARBURETOR—for smooth, quick acceleration response • DIAPHRAGM SPRING CLUTCH—for easy-action engagement • SYNCHRO-MESH TRANSMISSION—for fast, smooth shifting • HYPOID REAR AXLE—for dependability and long life • TORQUE-ACTION BRAKES—on light-duty models • PROVED DEPENDABLE DOUBLE-ARTICULATED BRAKES—on medium-duty models • TWIN-ACTION REAR BRAKES—on heavy-duty models • DUAL-SHOE PARKING BRAKE—for greater holding ability on heavy-duty models • CAB SEAT—with double-deck springs for complete riding comfort • VENTI-PANES—for improved cab ventilation • WIDE-BASE WHEELS—for increased tire mileage • BALL-TYPE STEERING—for easier handling • UNIT-DESIGNED BODIES—for greater load protection • ADVANCE-DESIGN STYLING—for increased comfort and modern appearance.

CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN

DOWN TIME COSTING TOO MUCH?

Check the record of these Ingersoll-Rand Diesels

Here's the Ingersoll-Rand drill-rig power unit that's built to big-engine standards of dependability, low maintenance and stamina, but built in a package approaching the small size and light weight of the automotive-type diesels.

The TS Diesel engine is a 4-cycle, 7" x 8½", 1000 rpm, supercharged engine built with 6 and 8-in-line cylinder and rated 285 and 380 hp for continuous, heavy-duty service . . . with ample reserve horsepower for overload periods . . . with fast acceleration . . . with lugging power at low speeds.

In the TS Diesel, you'll find modern and big-engine features like these: big 5¼" crankshaft . . . full-floating, interchangeable aluminum-alloy shells for both main and crankpin bearings . . . full-pressure lubrication . . . individual cylinder liners . . . replaceable cylinder liners . . . removable valve seat inserts . . . open combustion chambers . . . large single hole injection nozzles . . . and many others.

All these big-engine features add up to long life and less downtime.

When a drill-rig is shut down for unscheduled engine repairs, the downtime costs far exceed the natural price difference between the high-speed, lightweight automotive-type engines and the Ingersoll-Rand TS Diesel which is designed and built for rough, continuous service.

To get the facts on this TS Diesel, write for a copy of the new TS bulletin, Form 10027. Or ask your Ingersoll-Rand representative for a copy. Branches in principal cities all over the world.

"WE SAVED $10,000 IN 6 MONTHS BY USING I-R DIESEL ENGINES ON OUR DRILLING RIG"

Two 6-cylinder Ingersoll-Rand TS Diesel engines on a rotary oil-well drilling rig in North-Central Texas are shown in the photo. They replaced two automotive-type engines that had been on the rig for the previous six months.

After operating the Ingersoll-Rand engines for six months, the operators found that the running costs of the I-R units was 63.4% of that of the automotive-type units as far as lubricating oil and fuel costs were concerned. In case of engine parts and repairs, the Ingersoll-Rand engines cost only 6.8% of the others.

The drilling superintendent, an old timer in the business, stated "that they are by far the best drilling engines I ever used."

The contractor concerned wrote "All in all, computing the cost to us for each hour of down time occasioned by engine failure, we think that we have saved about $10,000 in the first six months operation of the Ingersoll-Rand engines as compared with the operations of the automotive-type engines in a similar period of time."

826-7

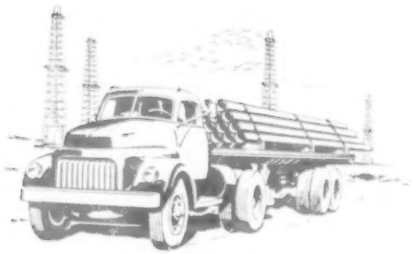
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

Eaton 2-Speeds cut hauling costs

Eaton 2-Speed Axles provide a gear ratio for every load and road situation; permit engines to run in the most economical speed range; reduce stress and wear on engines and power transmitting parts. This means lower cost right down the line: through reduced operating and maintenance costs, through faster trips, through longer truck life. And Eaton 2-Speed Axle trucks are worth more on the trade-in.

Let your truck dealer explain how Eaton's exclusive planetary gearing, forced-flow lubricating system, and positive shift control keep trucks on the job without expensive axle repairs.

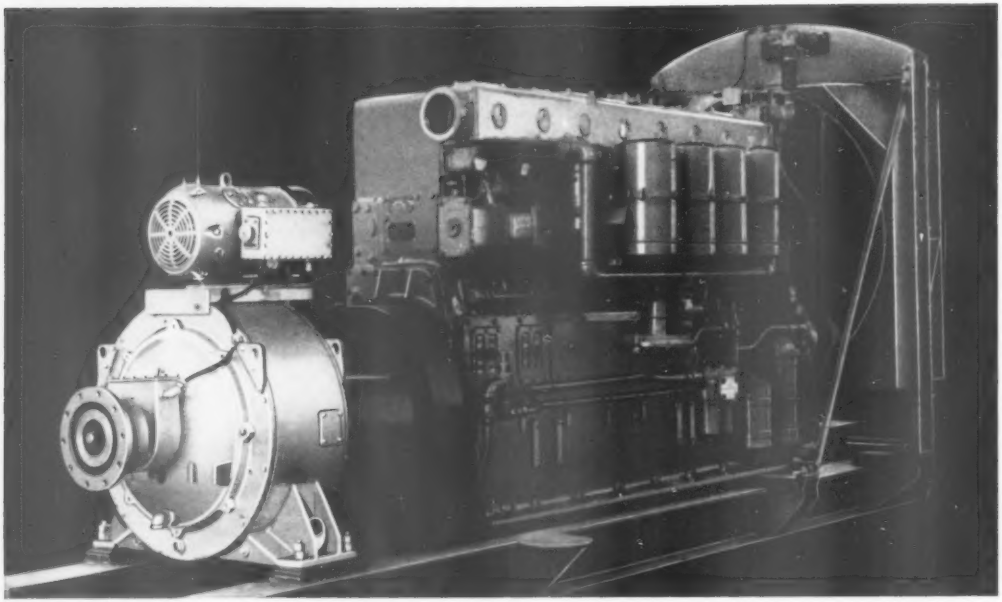


EATON *2-Speed Truck* AXLES

Axle Division
EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

INSIST ON ADEQUATE ROADS

Today, America's roads are crowded with twice the traffic they were designed to carry. Help end the national traffic jam by speaking up for more and better roads.



Dynamatic Water-Cooled Couplings for Rig Drives

Adjustable from 2% to 100% Slip in Continuous Operation

Instantaneous Control • No Friction or Wear

The new Dynamatic electro-magnetic Coupling replaces the friction clutch. Slip is adjustable from 100% to less than 2%. Water cooling permits continuous operation at 100% slip with full torque. Explosion-resistant construction. Available in convenient sizes for oil field engines from 350 to 750 horsepower.

Write for technical literature.

Oil Industry Sales and Service Representatives

GRIBBIN & BAYLOR

2930 Pease Avenue
Houston 3, Texas

529 General Petroleum Building
Los Angeles 17, California

Advantages of Dynamatic Couplings

- Engines are automatically brought to operating speed before load is applied.
- Serves as disconnect clutch.
- Infinitely variable torque and speed to rotary table.
- Pump speed and pressure controllable and pump can be stalled continuously at maximum pressure.
- Permit continual raising and lowering of pipe at full engine speed without use of clutch or brake.
- Engines cannot be stalled or loaded at idling speed.
- Master and individual controls give instantaneous response.
- Absorbs engine vibrations and shocks of suddenly applied loads.
- Uses conventional water system with simple connections.
- Has quick-disconnect electrical connections for easy portability.
- No wearing surfaces except bearings.

DYNAMATIC® CORPORATION • KENOSHA WISCONSIN

Subsidiary of EATON MANUFACTURING COMPANY, Cleveland, Ohio

Dynamometers • Oil Well Draw-Works Brakes • Adjustable-Speed Couplings • Eddy-Current Brakes
Ajusto-Spedes • Shovel Clutches • Press Drives • Lift Truck Clutches • Electronic Controls

The Model U-20 Drawworks has proven that it is a fast, smooth economical rig even under difficult drilling conditions. Drill Faster - - - with the SIX speeds to the rotary table ranging from 57 to 626 R.P.M. at maximum engine speed. Hoist Faster - - - with the SIX drum speeds, divided into a high and low range. SPEED - - - for hoisting empty blocks and POWER - - - for raising off slips readily available thru single lever high-low clutch control. Maximum trip speed is attained by the free spooling drum, hydromatic brake pipe "fall" control and the large powerful drum brake.

Buy Speed - - - Buy The Best - - - Buy The U-20

UNIT RIG -&- EQUIPMENT CO. TULSA, OKLAHOMA U.S.A.

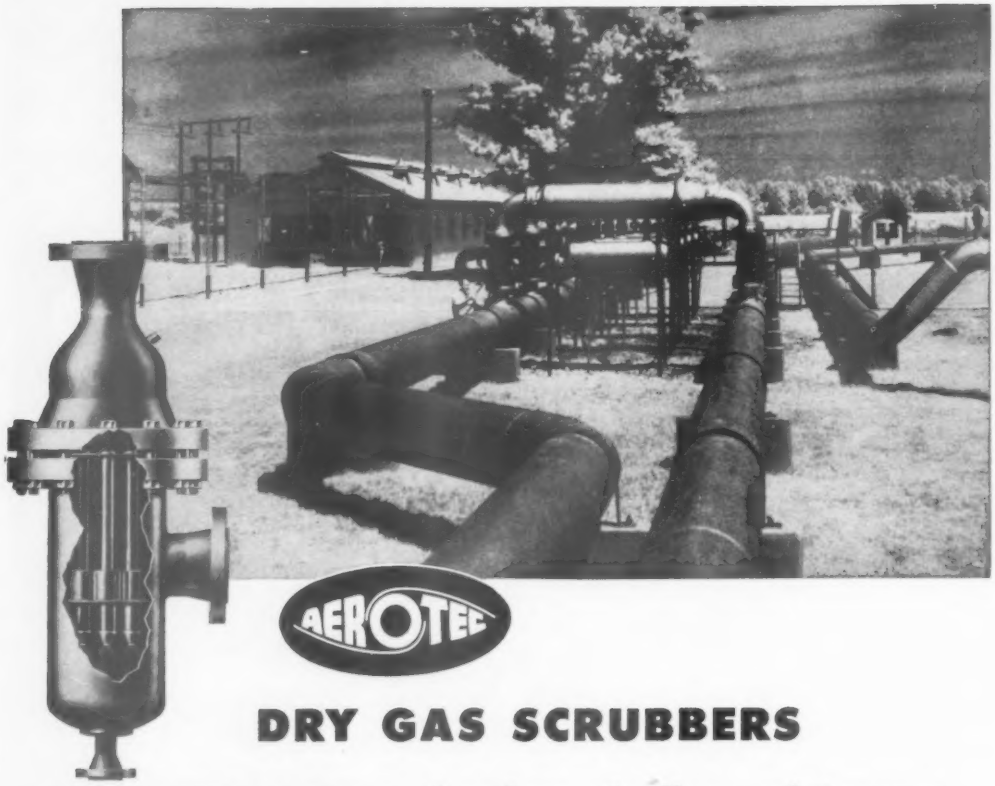
DESIGNED FOR THE JOB...

UR-521

UNIT RIG DRAWWORKS ARE SOLD EXCLUSIVELY THROUGH THESE AUTHORIZED DISTRIBUTORS IN THE U.S.A. AND CANADA

BOVAIRD SUPPLY COMPANY
HOUSTON OIL FIELD MATERIAL COMPANY
HOWARD SUPPLY COMPANY
IVERSON SUPPLY COMPANY
JONES & LAUGHLIN SUPPLY COMPANY
LUCEY PRODUCTS CORPORATION
MID-CONTINENT SUPPLY COMPANY
NORVELL-WILDER SUPPLY COMPANY
OIL WELL SUPPLY COMPANY

EXPORT SALES — MIDCONTINENT SUPPLY COMPANY, 42 Broadway, New York City. Cable — MIDUNITRIG



AEROTEC

DRY GAS SCRUBBERS

protect compressors and reduce pipeline maintenance

Dusts and distillates in natural gas put an unnecessary drag on profitable pipeline operation. Aerotec Dry Gas Scrubbers get rid of these damaging impurities with high efficiency, thereby reducing maintenance to a minimum. This is a proven fact in well and pipeline installations across the country.

The Aerotec Scrubber, unlike conventional types, uses no liquid filtering medium. Hence, you eliminate carryover of elements that cause compressor wear. You also avoid other difficulties normally encountered with wet-bath scrubbing methods. The Aerotec units assure clean, *dry* gas that flows freely and saves on repair and maintenance costs.

Basis of this efficiency is a unique method of scrubbing gas by the use of multiple, small-diameter tubes. Through the principle of dry separation by centrifugal force, foreign solids and liquids are precipitated, leaving the gas clean and dry.

Simplified piping permits easy installation of the compact, lightweight Aerotec Dry Gas Scrubber. Standard units up to 100,000,000 SCFD are available, with larger capacity requirements met by manifolding. For technical data and engineering assistance in selecting the Aerotec Scrubber best suited to your gas-cleaning needs, call or write our representatives today.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.

(Offices in 38 Principal Cities)

Canadian Affiliates: **T. C. CHOWN, Ltd., Montreal 25, Quebec; Toronto 5, Ontario**

Manufacturers

THE AEROTEC CORPORATION

GREENWICH, CONN.

Men who depend on power...know they can depend on CUMMINS®

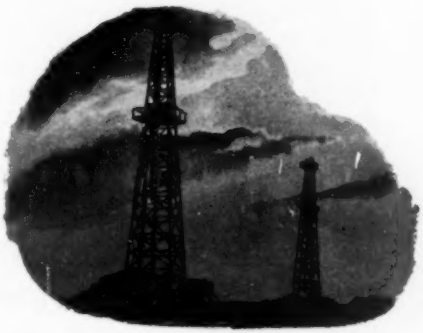
Every CUMMINS DIESEL is built not once but twice

Oil field men have learned to count on Cummins Diesels for dependable power day in, day out.

What's behind this consistent reliability? One good reason is the fact that every Cummins Diesel is actually built *twice*. After initial assembly, and run-in testing, every engine is disassembled, inspected; then reassembled and tested again.

This extra care—together with Cummins' economy-proved fuel system and efficient parts and service organization—makes lightweight, high-speed (50-550 h.p.) Cummins Diesels a wise first choice *for men who depend on power*.

Whatever your power needs, whether it's for drilling, pumping, or hauling, portable power units or generator sets . . . or any other important jobs . . . your Cummins dealer is the man to see.



CUMMINS ENGINE COMPANY, INC., Columbus, Indiana

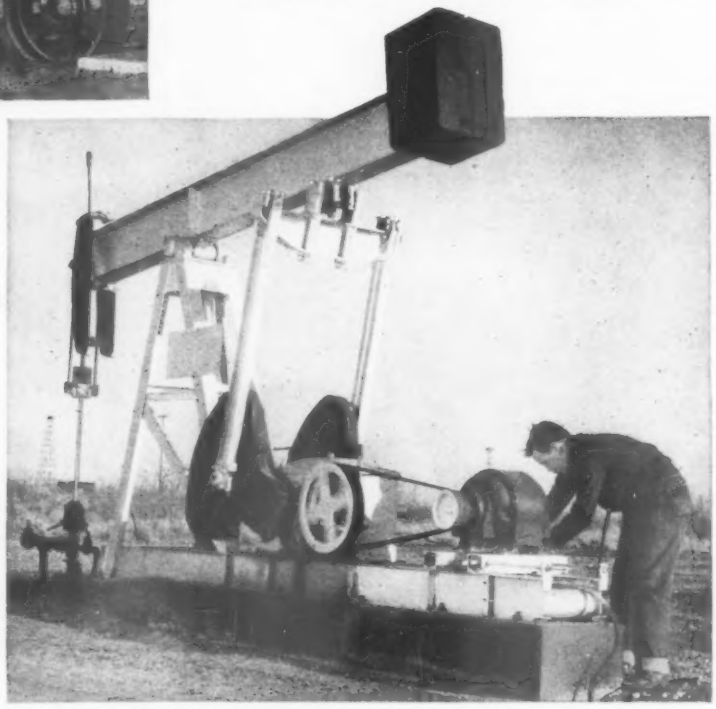
Export: Cummins Diesel Export Corporation
Columbus, Indiana, U.S.A. • Cable: CUMDIEX
(O-82)

CUMMINS DIESEL

TRADEMARK REG. U. S. PAT. OFF.

***Leaders* in lightweight, high-speed diesel power!**

How much difference can this sheave make . . . in this oil pumping job?



The man you see at this site can tell you—and so can hundreds of other oil-production men who have used the Worthington QD*.

Sheaves can be headaches. If they're made with solid hub, bored for tight fit on the shaft, they're tough to get off. If they're built with solid hub and loose bore for quick and easy removal, they often don't hold the shaft tight enough to withstand heavy shock loads without slipping. Not so with Worthington QD. Its unique two-piece design—*especially created to meet the demands of oil-production men*—makes it *easy to get on, easy to get off*. But with its heavy-duty, taper cone friction grip, it hugs that shaft *tight* against even the heaviest shock loads.

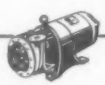
Local Worthington QD distributors in all oil-field areas are stocked-up in most sizes and they're backed up by factory stocks in Los Angeles, Fort Worth, Houston, Tulsa and New Orleans.

It'll pay you to STANDARDIZE on the Worthington QD. For more data, write for Bulletin V1400B7F to Worthington Corporation, Multi-V-Drive Sales Division, Buffalo, N. Y.

*Reg. U. S. Pat. Off.

MV.2.9

COMPRESSORS: AIR-COOLED, WATER-COOLED



PUMPS: CENTRIFUGAL, ROTARY, STEAM, POWER

MULTI-V-DRIVES: QD SHEAVES AND V-BELTS

VARIABLE SPEED DRIVES: WORTHINGTON ALLSPEED DRIVE, WORTHINGTON ALLSPEED MOTOR DRIVE

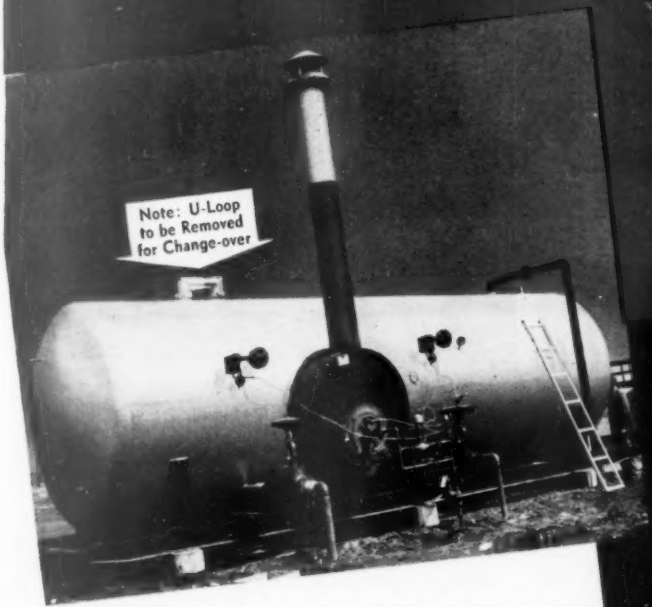
Buy these Worthington standard products from your local distributor

WORTHINGTON

Multi-V-Drives

How MALONEY CRAWFORD'S HORIZONTAL TREATER SOLVES Reservoir Gas Pressure Total Loss

By a 15 Minute Easy-to-Make Adjustment Using Bottom-Hole Pump Pressure



FOR USE IN

- *Old Oil Fields*
- *Water Flood Projects*
- *Fields where Gas Pressure is not Dependable*

Lack of gas pressure now is no problem, because bottom hole pump pressure is utilized to achieve a hydraulically pressured hook-up. The back pressure carried on the well will be the minimum pressure required to move oil to storage and/or water to disposal.

In 15 minutes to change treater connections you do only three things; (1) remove U-loop and plug connections (2) remove gas outlet and plug connection and (3) change over from one safety connection to another, plugging one.

This important control hook-up combination also is available on Maloney-Crawford vertical treaters. Write for Bulletin S-100 for details.

MALONEY CRAWFORD

MALONEY-CRAWFORD TANK & MFG. CO.

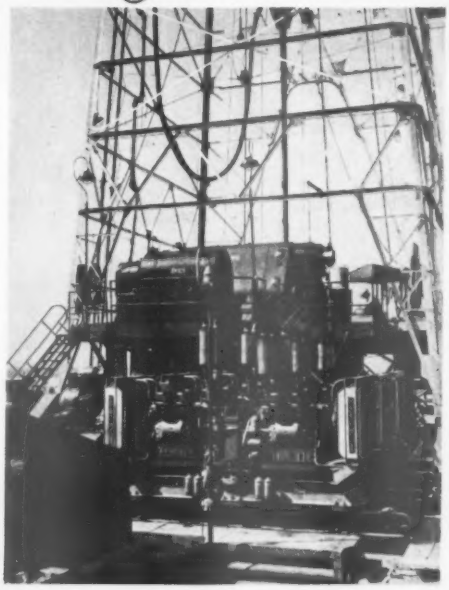
FACTORY AND GENERAL OFFICE: 38 NORTH PEORIA—BOX 659—TULSA, OKLAHOMA
EXPORT REPRESENTATIVE: Baird Lines, 420 Lexington Avenue, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford of Canada, Ltd., Box 4128, South Edmonton
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Co., Pampa, Texas

GM DIESEL
CASE HISTORY No. 47-903

USER: Coastal Drilling Co., Bakersfield, Calif., operating in San Joaquin Valley.

INSTALLATION: Three GM Diesel Quads, powering an Emsco J-1250 rig and two 8" x 20" Gardner-Denver mud pumps. Engines were purchased August 1, 1947.

PERFORMANCE: Three Quads have each operated 38,000 hours and never been off the rig for repairs. One of them operated 23,000 hours before pistons and liners were changed right on the rig.



This Diesel has worked 38,000 hours

without being off the rig for repairs

For five full years these three General Motors Diesel Quads have been drilling wells without needing to be removed from the rig. Costly down time is reduced to a minimum with GM Diesel multiple engine units because one engine can be serviced while others keep working. With good maintenance and parts replacement when needed, GM Diesels give thousands of hours of dependable service. They're compact—fit within road width—are easier to move. Two-cycle operation makes them fast accelerating for quicker round trips. Investigate GM Diesels before specifying power for your next rig.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN

SINGLE ENGINES...32 to 275 H.P. MULTIPLE UNITS...Up to 840 H.P.

Write for booklet, "A $100,000 Investment Insurance Policy." Then tell you why.

It pays to Standardize on

GM
GENERAL MOTORS
DIESEL POWER

CALIFORNIA—San Francisco, LAWLESS BROTHERS, Berkeley, WEST COAST ENGINE & EQUIPMENT CO.; Los Angeles, ANDERSON-O'BRIEN CO. COLORADO—Denver, COLORADO BUILDERS' SUPPLY CO. ILLINOIS—Centralia, WESTERN MACHINERY & ENGINE CO. KANSAS—Wichita, DIESEL EQUIPMENT CO., INC. LOUISIANA—Haynes, GEORGE ENGINE CO., INC.; Shreveport, UNITED TOOL & VALVE REPAIR CO. MICHIGAN—Detroit, EARLE EQUIPMENT CO. MISSOURI—St. Louis, WESTERN MACHINERY & ENGINE CO. MONTANA—Billings, SEITZ MACHINERY, INC.; Missoula, MOUNTAIN TRACTOR CO. NEW MEXICO—Albuquerque, HARRY GORMLEY COMPANY. NORTH DAKOTA—Fargo, SWEENEY BROTHERS TRACTOR CO. OKLAHOMA—Oklahoma City, DIESEL POWER CO. TEXAS—Brownsville—Corpus Christi—Dallas—Houston—Lubbock—McAllen (San Juan)—Odessa—Wichita Falls, STEWART & STEVENSON SERVICES, INC.; Pleasanton, DIESEL POWER, INC. UTAH—Salt Lake City, CATE EQUIPMENT COMPANY. WYOMING—Cheyenne, COLORADO BUILDERS' SUPPLY CO.

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

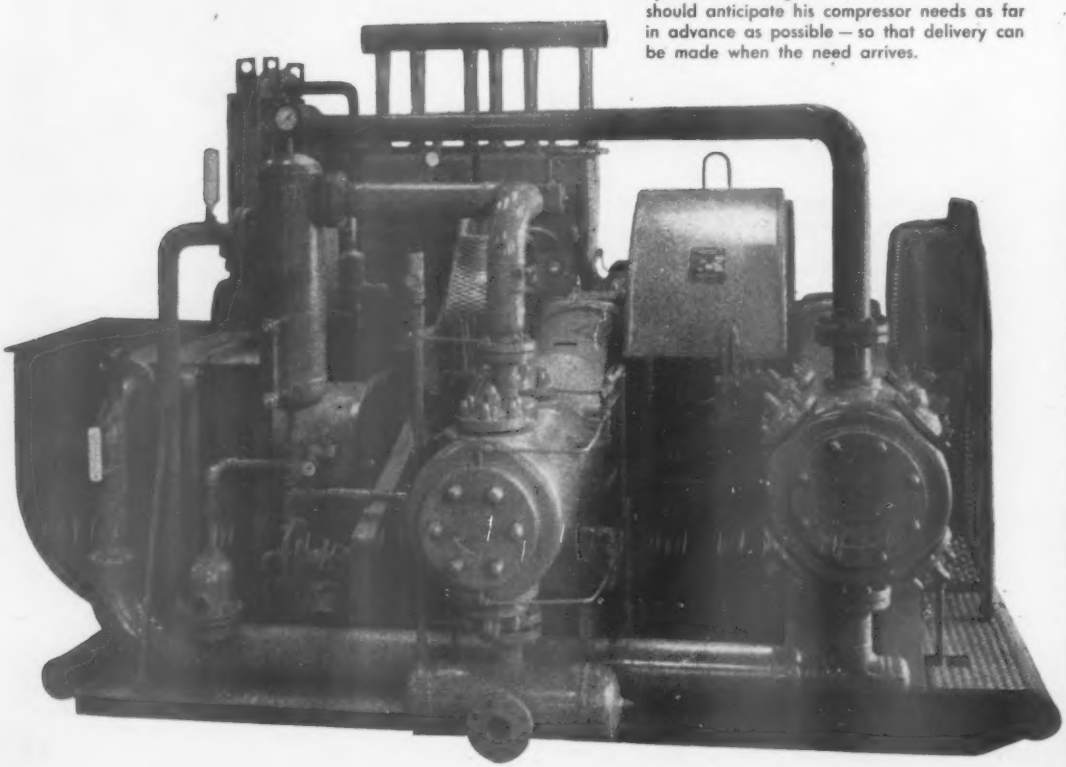
75 pounds in a single stage.

NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.

85 H.P. 150 H.P. 500 H.P.

Whatever Your Needs . . . . . Wilson Supply — Ingersoll - Rand *"Packaged"* Portable Compressors Have Proven Their Leadership in Dependable, Economical Operation.

While Wilson Supply Company has many sizes of Compressors in stock or on order—varying field conditions and requirements make it impossible to carry all sizes of compressor cylinders and engines. Therefore the Producer should anticipate his compressor needs as far in advance as possible — so that delivery can be made when the need arrives.



THE COMPRESSOR DIVISION OF WILSON SUPPLY COMPANY *Pioneered* THE "CLOSED GAS LIFT SYSTEM" OF PRODUCING OIL . . .

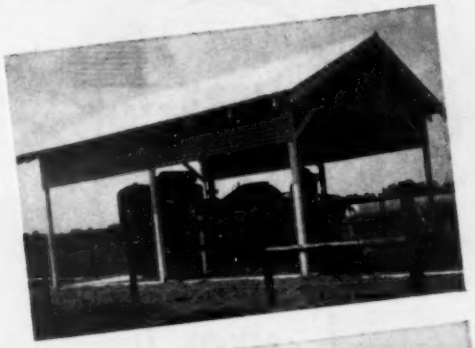
The Field photographs on this page emphasize the adaptability of Wilson Supply — Ingersoll-Rand "Packaged" Portable Compressors in meeting the varying field condition of the producer.

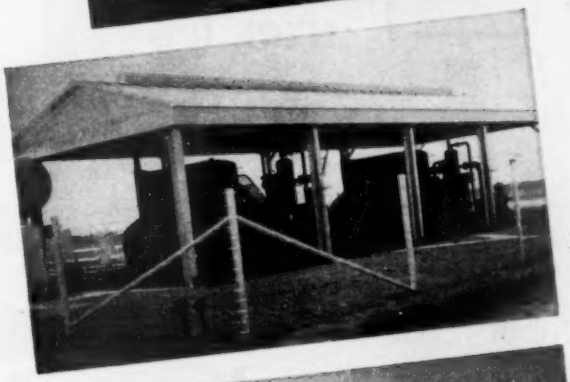
If your requirements for Gas Lifting calls for 85 H.P., 150 H.P., or 500 H.P. — you can get the desired result with an installation of these "Packaged" Portable Compressors.

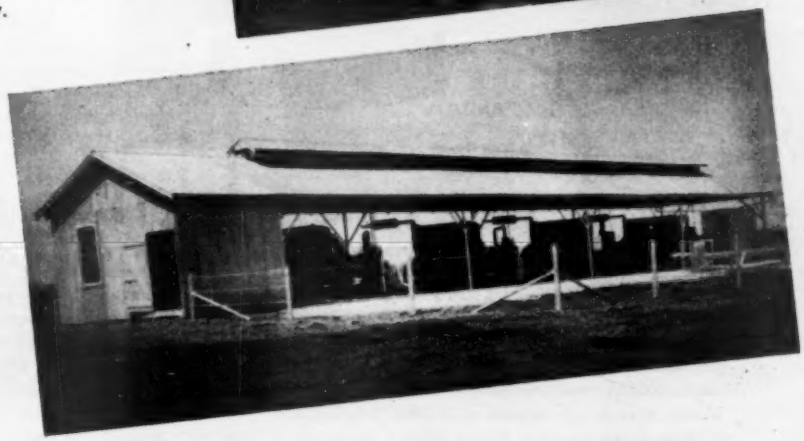
In event of a change in field conditions, these units may be split and moved to other locations at very nominal expense.

The "Know How" of Wilson Supply Company in fabricating these units means dollars saved to the purchaser in long life and trouble free performance.

Whatever your Compressor needs — consult with the Compressor Division of Wilson Supply Company.







Contact your nearest Wilson Supply Store or write "Compressor Division," Wilson Supply Company, P. O. Drawer 19, Houston, Texas, for detailed information, and quotations. Please give suction and discharge pressure and volume to be handled.

WILSON SUPPLY COMPANY

Branch Stores

TEXAS: Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Monahans.

LOUISIANA: Lake Charles, New Iberia, Houma, Harvey, Shreveport.

1412 Maury St.
HOUSTON,
TEXAS

Sales Offices

DALLAS, TEXAS
TULSA, OKLA.
SHREVEPORT, LA.
NEW ORLEANS, LA.

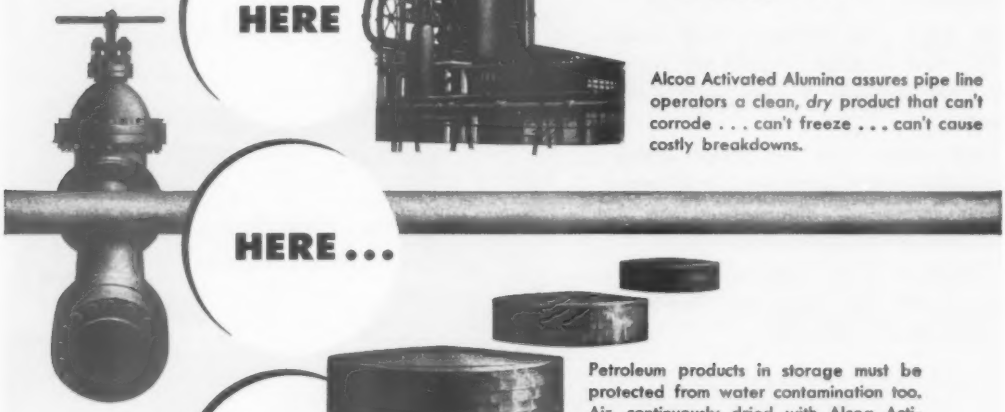
Prevent moisture contamination of petroleum products

HERE . . .

Oil tankers carry dehydration units containing Alcoa Activated Alumina to keep crude and finished oils constantly *dry* while in transit.

HERE

Refineries dry everything from instrument air to liquid propane with Alcoa Activated Alumina—to guard against corrosion, rusty lines and clogged valves.



Alcoa Activated Alumina assures pipe line operators a clean, *dry* product that can't corrode . . . can't freeze . . . can't cause costly breakdowns.

HERE . . .

Petroleum products in storage must be protected from water contamination too. Air, continuously dried with Alcoa Activated Alumina, blankets oil in storage tanks, prevents entry of outside moisture.

AND HERE WITH ALCOA Activated* ALUMINA

ALCOA Activated Aluminas are among the most efficient desiccants available to the petroleum industry for the dehydration of liquids, gases and gaseous hydrocarbons. Dew points as low as *minus* 100° F,—and even lower—may be obtained. Under normal circumstances ALCOA Activated Aluminas can be used for an almost indefinite number of drying cycles.

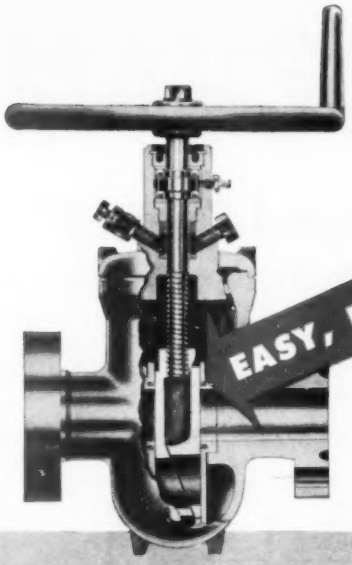
ALCOA Activated Alumina is non-corrosive . . . resists shock, abrasion and erosion . . . will not change its form or properties. Perhaps dehydration with this commercially pure aluminum oxide can speed up *your* operations—protect *your* products from costly moisture contamination. Write for details today. ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 618-J Gulf Building, Pittsburgh 19, Pennsylvania.

**Reg. T. M. Aluminum Co. of America*

Alcoa Chemicals

ALUMINAS and FLUORIDES

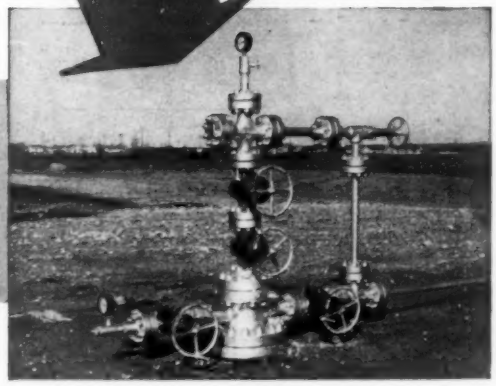
ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

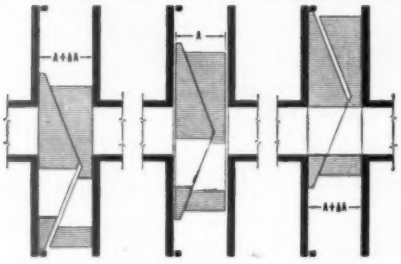


EASY, POSITIVE SHUT-OFF HERE.. MEANS SURE, SAFE CONTROL HERE!

W-K-M Parallel Expanding Gate provides a pressure-tight seal, open and closed — permits free-running operation under full-rated pressure.

Double-thrust Roller Bearings, ground stem threads, superfinished stem where it passes through the packing, contribute to the easy operation of W-K-M valves.





In closed position, the gate (left) and segment (right) seal tightly against both seats.

When opening or closing, the gate and segment are in neutral position, permitting free upward or downward movement of the gate assembly.

When open, the gate and segment again seal tightly against both seats and the bore of each lines up perfectly to provide a smooth, turbulence-free passage.

For the greatest safety, greatest operating reliability, oil men the world over specify W-K-M valves for their Christmas trees. The basic design of W-K-M valves (illustrated at left) provides a sure, tight seal in opened and closed positions and free-running operation while opening or closing.

Oil men specify W-K-M, too, because of its large and competent field organization qualified to render field emergency service and assist W-K-M valve users in any valve problem. W-K-M valves may be serviced and even completely overhauled without removing them from the Christmas tree.

Specify W-K-M for the surest and safest well control — for W-K-M valves are by far the most economical in the long run. 80% of the world's high pressure wells are controlled by W-K-M valves.

All W-K-M Valves Have

Through-Conduit Fluid Passage • Parallel Expanding Gate Assembly • Oversize Replaceable Seats Pressure Seal Bonnet • Double Row Thrust Bearings on Stem • Internal Lubrication

W-K-M COMPANY
P. O. BOX 2117 HOUSTON 1, TEXAS
727 W. SEVENTH STREET, LOS ANGELES, CALIF.
EXPORT OFFICE: 30 Rockefeller Plaza, New York, N. Y.

W-K-M *Valves*

OILFIELD • PIPE LINE • PROCESS VALVES

STEER YOUR WELL WITH Eastman "Directional Control"

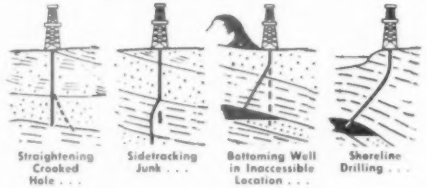
THE Eastman

REMOVABLE WHIPSTOCK

Deflects Your Well in a *Planned* Direction!

Recognized for its dependable performance under the most difficult conditions — at any depth — in either hard or soft formations. Simple to place in position and remove. Used extensively for sidetracking, straightening hole or reaching predetermined locations. Available in sizes from 4 to 13 inches. A target-hitter.

No Matter What Your Problem May Be



. . . Eastman experienced engineers, advanced-design tools, and field-proved instruments are available for immediate service.

THE Eastman

SINGLE-SHOT Survey Instrument

Checks Deviation and Direction of Well-Course

Obtains reliable and easy-to-read records quickly. The regular drilling crew can operate this tool with utmost ease. May be run into hole on sand-line, drill-pipe, or in conjunction with retractable coring equipment. Units available to record from 0 to 5, 10, 18, 30, or 90 degrees from vertical. Readings are extremely simple to interpret.

Originators of Controlled Directional Drilling
Pioneers of Oil-Well Surveys

Eastman Directional Drilling Oil Well Surveys

EASTMAN OIL WELL SURVEY CO.
LONG BEACH DENVER HOUSTON

Export Sales and Service:
EASTMAN INTERNATIONAL COMPANY
P. O. Box 1500 Denver, Colorado

22 Offices for Your Convenience
Consult Your Telephone Directory

MARSH *Introduces*–

the most significant pressure gauge development since the "Recalibrator"

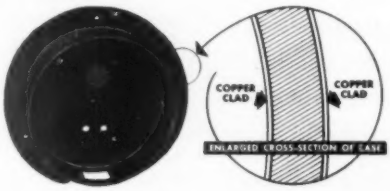
Socket, tube, and end-piece fused into one-piece unit —The problem in every pressure gauge has always been to make permanently leak-tight joints from the inlet to the tip of the bourdon tube.

Marsh construction has always provided the utmost in leak-tight assemblies. But just as welded piping is always more sound than the best joined piping, the fusing of the assembly into an integral unit reduces the possibility of leakage to the vanishing point.

It required extensive research to develop a method of welding the parts into a one-piece unit, but a special process has now been perfected. The result is known as

the "Canoweld" Tube

After fusing, the tube is accurately tempered to required resiliency. The unretouched photo of a socket sawed in half shows the perfect fusion of the joint most difficult to make — the joint where the tube enters the socket. Photomicrographs are available to prove the perfection of the process.



Four times as strong and one-third lighter than a cast iron case — This copper-clad, wrought steel case of boiler plate thickness has the advantages of any type of case — without the faults. It is known as

the "Marshalloy" Case

This case is four times as strong and one-third lighter than conventional cast iron cases. The copper surface makes it as non-corrosive as a plastic or die-cast case. It is finished in a newly developed corrosion-resistant satin black enamel that makes it as attractive as it is durable. Fitted with Marsh safety blow-out plug, it sets a new standard in gauge housing.

THE Marsh developments presented here unquestionably represent the two greatest contributions to pressure gauge accuracy and stamina in recent years . . . the most important advancements since the introduction of the Marsh "Recalibrator."

These improvements take on all the more significance from the fact that they are contributed to the line of gauges that has become the symbol of gauge accuracy and permanence . . . the Marsh "Mastergauge" line.

Foremost and most basic of these improvements is the fusing of the socket, tube, and end-piece into the equivalent of *one-piece* construction. Marsh Methods have always achieved the utmost in leak-tight construction, but here is something still better: the joints are *eliminated!*

Second only to the one-piece socket, tube, and end-piece is that new "Marshalloy" copper-clad case. It is a case that retains all advantages of all kinds of cases; eliminates all the faults.

Read the facts opposite and you will see how the finest line of pressure gauges has been made still better.

MARSH INSTRUMENT CO.
Sales Affiliate of Jas. P. Marsh Corp.
Dept. L, Skokie, Ill.

Houston Branch Plant
1121 Rothwell St.
Houston, Texas

MARSH GAUGES

"THE STANDARD OF ACCURACY"

THERMOMETERS • WATER REGULATING VALVES
SOLENOID VALVES • HEATING SPECIALTIES

CP TYPE B REAMERS eliminate tapered holes and reaming to bottom. CP "bottom" reamer, run close above the bit, insures a true round, full-gauge hole. CP "stabilizer" reamer centers drill stem and prevents wall drag. Cutters securely held in reamer body by tapered keys.

All popular sizes of CP Oil Well Tools are carried in stock for prompt delivery.

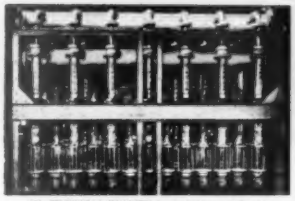
CHICAGO PNEUMATIC TOOL COMPANY

MANUFACTURED AT FRANKLIN, PA.

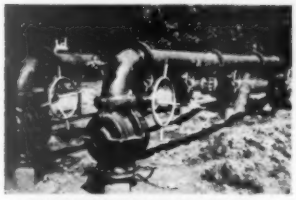
GENERAL OFFICES: 6 EAST 44th STREET, NEW YORK 17, N. Y.

Oil Tool Division Office: One N. W. 16th Street, Oklahoma City, Oklahoma

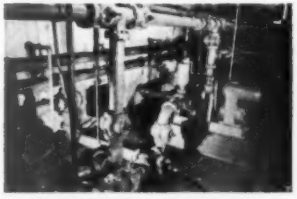
In Canada: 10103 81st Avenue, So. Edmonton, Alberta, Canada • In Mexico: Mexico, D. F., Rosas Moreno No. 41; Tampico, Tamps., Apartado No. 174.
Special Oil Tool Export Agent: E. F. Gahan, Inc., 500 Fifth Ave., New York 17, N. Y. (West Indies, Central and South America, exclusive of Mexico)



IN CHEMICAL PLANTS a.c.f. Round Port Valves provide quick emptying, full protection against corrosive action.



IN THE PETROLEUM AND GAS INDUSTRY a.c.f. Round Port Plug Valves provide full-area flow with fast shut-off.



IN SEWAGE PLANTS a.c.f. Valves offer uninterrupted flow. CYLINDRICAL plug actually shears obstructions.

100% OBSTRUCTION FREE

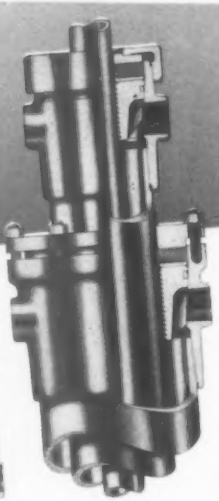
The passage of an a.c.f. Round Port Lubricated Plug Valve exactly conforms to the size and shape of the pipe. Ideal for capacity flow of abrasives and suspensions, these valves have the same quick, quarter-turn shut-off feature of rectangular port a.c.f. CYLINDRICAL "Full Pipe Area" Plug Valves. In addition, an a.c.f. Valve cannot wedge in its seat. Why tolerate a less efficient valve?

a.c.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalogue 4-OG, American Car and Foundry Co., Valve Division, 1501 E. Ferry Ave., Detroit 11, Mich.

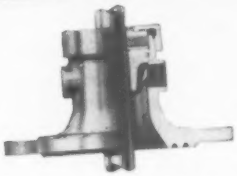
Representatives in 50 Principal Cities

RECTORHEAD Type R Casing and Tubing Heads meet ALL Low-Pressure Producing Conditions

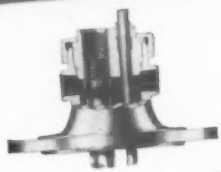


Threaded bottom Type R Tubing Head with slips and stripper. For workover jobs a second stripper can be used in place of slips in adapter bowl. Slips and stripper are interchangeable in head and bowl.

Type R Casing Head with threaded connection. Notice how ribbed construction of slips permits full flow to side outlets; also simplicity and effectiveness of sealing arrangement.



Type R Tubing Head with light flange for use on flanged casing head . . . or when replacing high pressure tubing head and tree when changing from flowing to pumping conditions.



The original tubing head installation can be adapted to Kobe Pump by using special threaded mandrel with stuffing box for power lines. The mandrel, resting on ground joint seat, has an "O" ring seal.

● Extremely adaptable, these low cost, low-pressure, forged steel casing and tubing heads are your most practical and efficient answer to a wide range of producing conditions. They are the safe, economical, easily installed heads for low-pressure wells. The tubing head with flanged bottom can be used when changing from flowing to pumping conditions. Flange has standard API ring groove and bolting arrangement.

Slip bowl adapter is available to carry slips, packing and gland so strippers can be used in head body. Strippers and slips are interchangeable.

Both heads have the same sealing arrangement . . . an oil-resistant pack-off that is forced into sealing position around pipe and head body by a split packing gland. On the casing head this gland is tightened down by six stud bolts . . . on the tubing head by a cap threaded to the body. Slips are case hardened, three segment type with ribbed construction to allow full flow to side outlets.

If you are getting ready to finish a low-pressure well or change from flowing to pumping, ask your Rector Representative or authorized supply store for complete details about Rector Type R Casing and Tubing Heads.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER ★

1100 NORTH COMMERCE ST FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

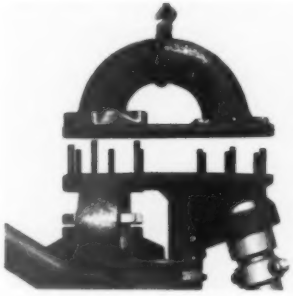
RECTORHEAD RECTOR KOBE CEMENTING METHOD RECTORSEAL

Emsco presents a new high capacity swivel

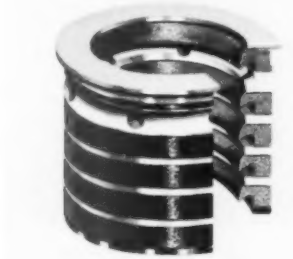
The new Emsco K-11 is a high capacity, extremely rugged swivel. Its performance in the field has been outstanding. It incorporates many new features and retains many of the old features that have been responsible for the lower operating costs and dependability of Emsco swivels.

Weight of the K-11 has been kept down . . . height reduced . . . hook clearance increased. The reduced weight of the K-11 lessens the danger of kellys being bent.

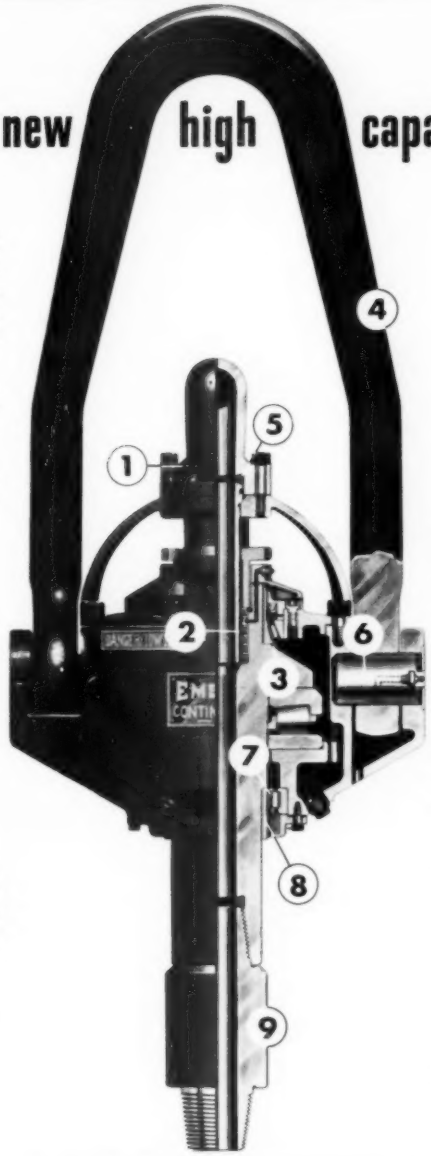
Shown on this page are some of the outstanding features of the K-11. For full details, call CONTINENTAL.



1. Platform-mounted gooseneck permits the top of the gooseneck to lift off without disturbing the rotary hose connection, reducing time required to replace washpipe and packing. Sturdy construction of gooseneck platform prevents misalignment of the washpipe.



2. Cartridge packing. The K-11 is equipped with Emsco's exclusive, time-saving, long-wearing, one-piece Cartridge Washpipe Packing. Designed to fit only one way, it cannot be incorrectly installed. The Cartridge Packing is made of five lip-type sealing rings. The top ring serves as a grease seal, assuring lubrication of the packing. The bottom four rings seal against highest mud pressures. Only one of the soft, flexible sealing rings is in contact with the washpipe at a time. As each lip wears the sealing function passes on to the next higher lip.



3. Longer bearing life. Adjustment of the main load bearing in the K-11 is easily maintained without going into the swivel body. This is achieved by using an adjustable radial thrust upper sleeve bearing.

4. Bail—provides more hook clearance; rests at an angle of 30° above horizontal opposite the gooseneck.

5. Washpipe Seal. Wedge-shaped rubber washpipe to gooseneck seal prevents mud leakage and holds washpipe securely in place.

6. Replaceable Bail Pin—mounted in double shear and grease lubricated.

7. High Capacity Radial and Radial Thrust Bearings–located at extreme ends of sleeve-body—give maximum stability to sleeve and assure equal distribution of load.

8. Replaceable Wear Rings are positioned under lower and upper oil seals.

9. Replaceable Subs—adaptable to any size kelly. With sub removed, the sleeve assembly can be removed from swivel body without removing coupling.

E-124-F-52

EMSCO

EMSCO DERRICK & EQUIPMENT COMPANY

Houston, Texas • LOS ANGELES, CALIFORNIA • Garland, Texas

CONTINENTAL

"SERVING THE OIL AND GAS INDUSTRIES"

THE CONTINENTAL SUPPLY COMPANY, General Offices: DALLAS, TEXAS

Export Div.: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
The Continental Supply Company, Limited, 216 Lancaster Bldg., Calgary, Alberta

Representatives: Argentina, Bolivia, Brazil, Chile, Colombia, England, Ecuador, Peru, Trinidad, Uruguay, Venezuela

Fluid couplings

NOW STANDARD EQUIPMENT ON EMSCO RIGS

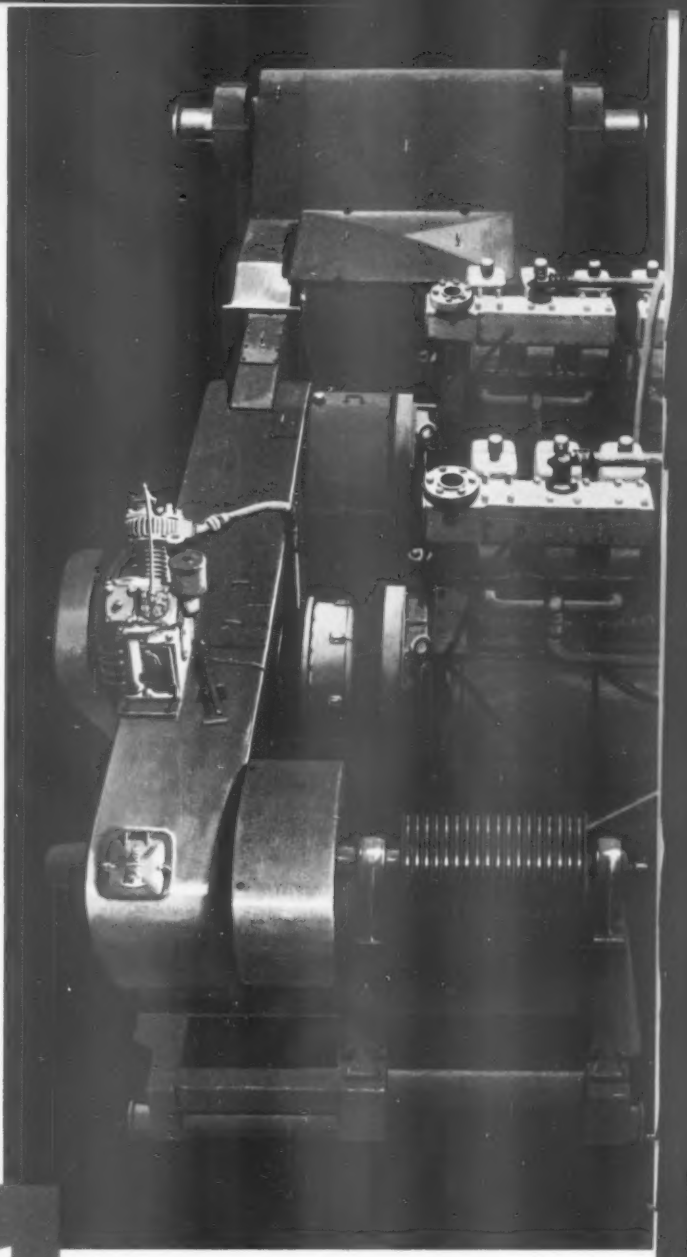
You no longer have to special order fluid couplings for your GB-350, 500 or 800 Rigs. Disconnecting type fluid couplings are now built-in standard equipment on these rigs.

Disconnecting type fluid couplings give your rigs many operational advantages:

1. **An efficient fluid drive** . . . at less cost.
2. **Easier handling of loads.** The fluid cushion in the couplings allows loads to be picked up without strain or jar, or overstressing of vital parts.
3. **Elimination of stalling.** No starting load, shock load or overload can stall engines.
4. **Output torque is always equal to full input torque.**
5. **Protection of engines and rig against overloading.**
6. **Uniform distribution of load on compound drives.**
7. **Faster acceleration of load.**
8. Disconnecting type fluid couplings function as engine clutches.
9. Emsco's exclusive mounting arrangement permits couplings to remain on transmission when engines are removed.

The total result of these advantages is a reduction in wear on parts . . . longer life for your rig. And you still get the power flexibility and the cost-saving, time-saving portability of Emsco GB Rigs.

For specifications and operation details, call CONTINENTAL.



EMSCO

E-124-B-52

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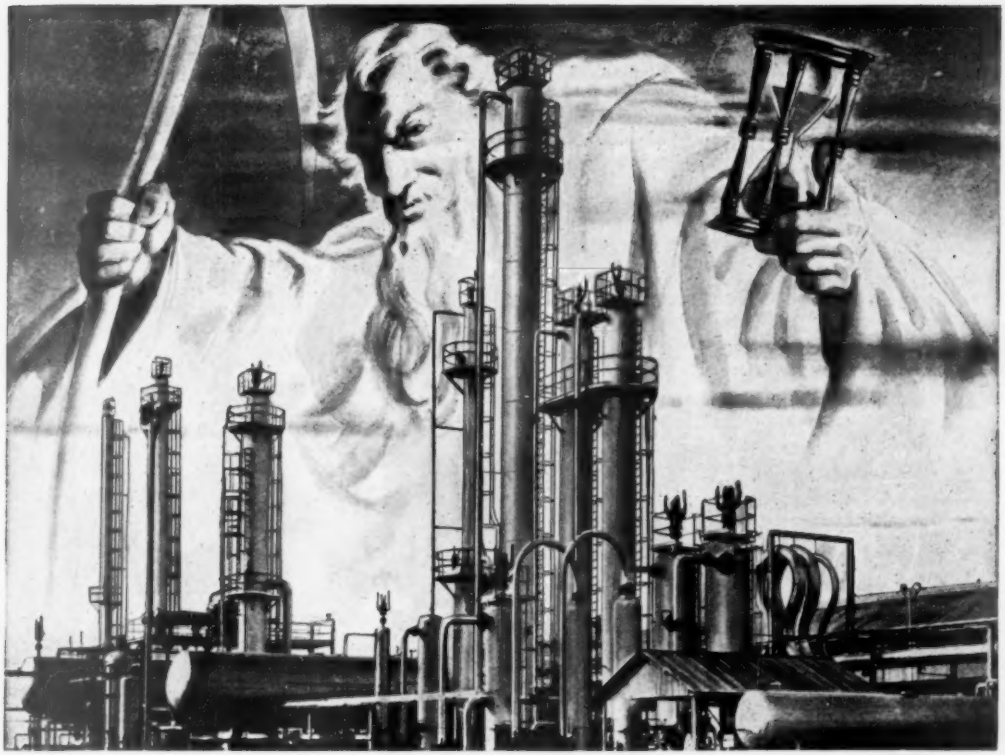

Since 1929, A. O. Smith has been helping the petroleum, Petro-chemical, chemical and paper industries solve many of their difficult corrosion problems.

The Ultimate JUDGE is TIME

Smithlined vessels have been in continuous corrosive service for over 20 years without failure of the lining attachment or the vessel itself.

This history of service is significant. It confirms the findings of our own research laboratories and supports the designs of our engineers, that closely controlled resistance-welding of stainless or other corrosion resistant liners to carbon steel vessel walls is the best means of providing long-term service and satisfactory performance under specific corrosion, pressure and temperature conditions.

If you have a corrosion problem, let A. O. Smith work with you in solving it. Our engineers and laboratories have an unequalled background of experience and data gained from hundreds of successful applications of Smithlining. Contact our nearest district office.

78½ ANNIVERSARY

A.O.Smith

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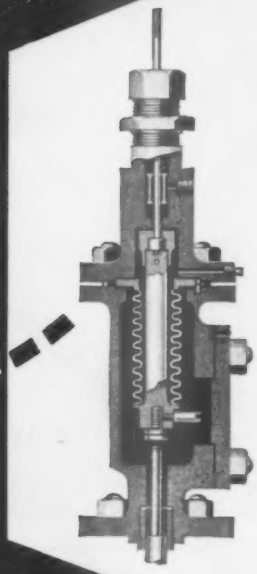
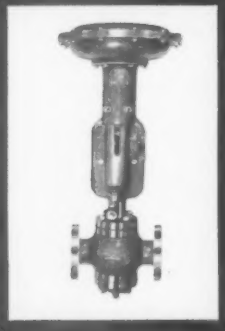
POSITIVE PROTECTION . . .



prevents dangerous or costly leakage



The bellows seal of the Honeywell Series 700 Valve is a metal barrier which insures against loss of valuable or dangerous fluids . . . cannot buckle or twist . . . is precision-machined . . . takes pressures up to 600 pounds. The Honeywell Series 700 wide band proportional control valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-2.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* 1906 Windrim Avenue, Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
VALVE PRODUCTS

First in Controls

HOUSES BUILT AT A FACTORY...

YOUR *BEST* BET FOR OIL FIELD HOUSING . . .

STURDYBILT Prefabricated Houses are precision built *at the factory.* Top grade, seasoned lumber is used exclusively; and each prefabrication section is made to fit with every other section.

You can choose from many standard designs that will fit every housing need, large or small. Whether you need one small lease house or an entire oil field camp, one purchase order takes care of plans, construction, transportation and erection. What's more your factory-built STURDYBILT houses can easily be moved from one site to another with little or no loss of material.

■ **WRITE FOR INFORMATION**

● **MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK**

STURDYBILT

PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. ● TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

a few words about alloy steels

and how we can help you switch to ALTERNATE ALLOY GRADES

You've probably had trouble getting the alloy steels you've been accustomed to running. You've got the headache of choosing the best available alternate alloys, plus the headaches of how to machine and heat-treat them.

That's where we can help . . .

Republic 3-Dimension Metallurgical Service combines the experience of your metallurgist and your production men with our 3-man team . . . the Republic Field and Laboratory and Mill Metallurgists. You tell us what you want the steel to do . . . we tell you the best available alternate, help you take the bugs out of using it.

In spite of restrictions you can probably switch to one of the many grades being made by Republic . . . world's largest producer of alloy and stainless steels.

When may our Republic Field Metallurgist call?

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

LAB MILL FIELD
3-DIMENSION Metallurgical Service

Republic ALLOY STEELS
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Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

WE HAVE CENTRALIZED YOUR OKLAHOMA SUPPLY SOURCE

Central Oklahoma, one of the oil industry's most active areas, and now site of Mid-Continent's newest, most modern field supply store. Our Oklahoma operations have been centralized to provide more rapid, more complete service to operators in this oil rich area. When your needs demand sure service, sure supply, look to the flashing neon derrick atop Mid-Continent's new Seminole store!

SYMBOL OF SERVICE AND SUPPLY IN OKLAHOMA!

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

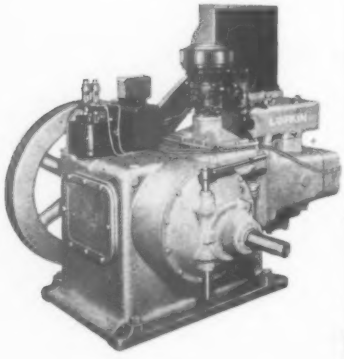
MID-CONTINENT Supply Company

General Offices: Mid-Continent Bldg. FORT WORTH, TEXAS

WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

This advertisement is one of a series featuring popular makes of gas engines in field service.

for LOW COST PUMPING choose a GAS ENGINE



LUFKIN and ENSIGN team up for dependable engine power

The rugged simplicity and economy of gas engines on hundreds of thousands of pumping rigs have long proved their worth. Today's engines, are designed in every detail for the pumping operation.

ENSIGN contributes vitally to the performance and success of a gas engine. Correct gas-air mixtures for easy starting, yet an entirely different mixture for the working range—all in one carburetor. In addition, these features may be combined with a gasoline standby provision, thereby making the ENSIGN "combination" carburetor as shown on the Lufkin Gas Engine below.

Our engineers in Huntington Park, Chicago or in the field will gladly work with you on carburetion problems.

ENSIGN CARBURETOR COMPANY

7010 S. ALAMEDA ST., HUNTINGTON PARK, CALIF.

HUNTINGTON PARK, CALIF.

CHICAGO 36, ILL.

LOS ANGELES 23, CALIF.

DEALERS AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

LUFKIN H-303 Gas Engine with ENSIGN model C Combination Carburetor.

IT'S PACKED WITH SATISFACTION WHEN IT'S PACKED WITH R/M

In hydraulic systems, as in this hydraulic accumulator ram, and all kinds of fluid-handling equipment, Raybestos-Manhattan Packings and Gaskets are assurance of continuous trouble-free operation. The R/M distributor near you will help you select the right R/M Packings and Gaskets for your valves, pumps, compressors, tanks and other equipment. Call him in.

FOR R/M "TEFLON" PACKINGS, GASKETS, SHEETS, RODS, TUBES, SEE YOUR R/M DISTRIBUTOR

R M PACKINGS

RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Crawfordsville, Ind.; Passaic, N.J.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Sintered Metal Products • Bowling Balls

Warner Electric Brakes bring you the dual safety factor of two independent braking systems for

SAFE STRAIGHT-LINE BRAKING

With Warner Electric Brakes on your trailers, your drivers have a *double* measure of safety.

Warner Electric Brakes provide an independent trailer braking system which synchronizes precisely with the tractor brakes. This gives you *two* systems . . . if one should become inoperative for some reason, you still have control.

And Warner Electric Brakes make possible *instant synchronization* of the trailer and tractor systems because Warner brakes operate *electrically*. There is no time-lag in the action at any point . . . braking is controlled and operated with *lightning speed*. You get *immediate* response of *all* brakes at the same time . . . in the exact degree of power desired!

You get smooth, *straight-line* deceleration and stops. Tractor and trailer act as a single unit to guard against skidding, diving, sliding, jackknifing.

Thus, with Warner Electric Brakes you have carefully engineered, completely *balanced* braking of *two* independent systems for double safety, double dependability to match any road or load condition!

OUR 25th YEAR—WARNER ELECTRIC BRAKE & CLUTCH COMPANY, BELOIT, WISCONSIN

WARNER

ELECTRIC BRAKES

FOR TRUCK TRAILERS

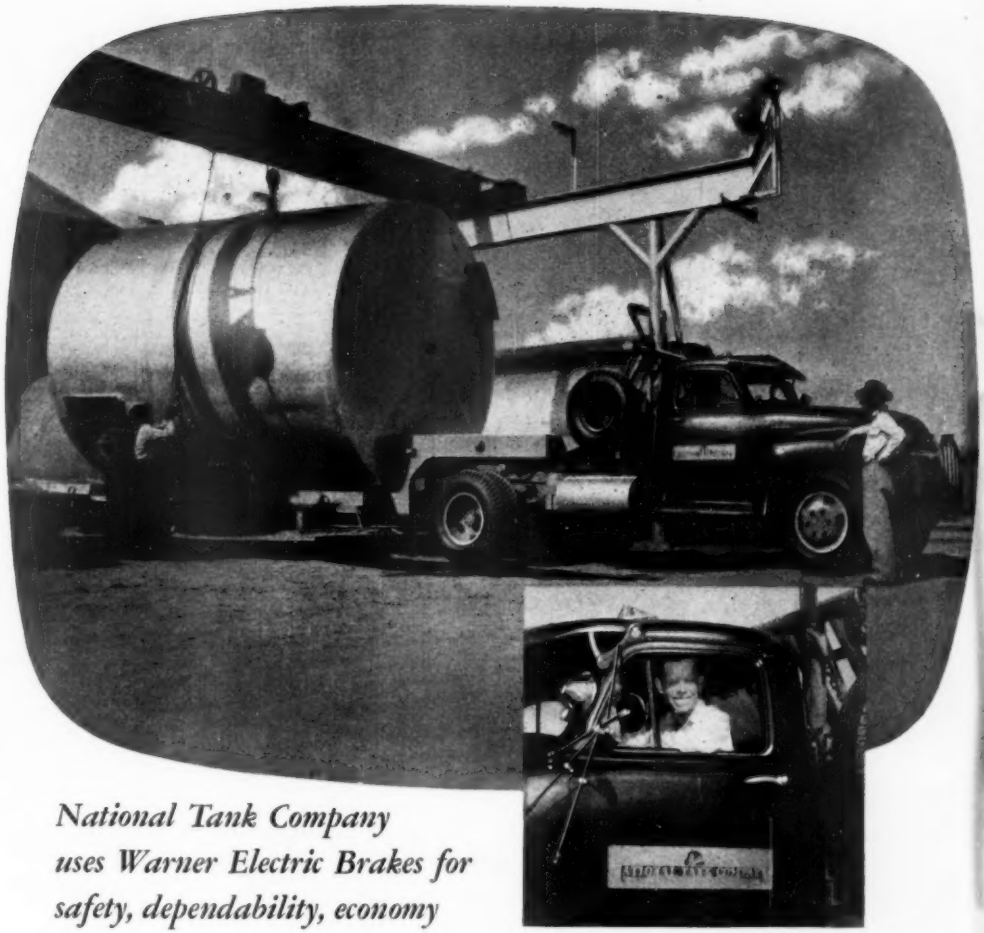
YOU ARE INVITED TO ATTEND

WARNER

AUG. 15—NOV. 25

IN THE INTERESTS OF

BETTER BRAKING AND GREATER HIGHWAY SAFETY



National Tank Company uses Warner Electric Brakes for safety, dependability, economy

In every important oil field you find National Tank Company equipment helping in the production of oil and gas.

This means that National Tank Company truck trailers operate in all types of weather, over all types of roads and fields to serve the industry. Having some 20 years' experience with Warner Electric Brakes, this firm finds the Warner system especially adaptable to many of its trailers and the specialized hauling they perform.

In citing the various advantages of Warner Electric Brakes on National's trailers, the following are pointed out: Ease of hook-up—no worry about connections wearing or breaking loose. No exposed equipment to break, split, leak. Safety—no "lock up or freeze"... perfect synchronizing. Dependability. Economy of installation and operation.

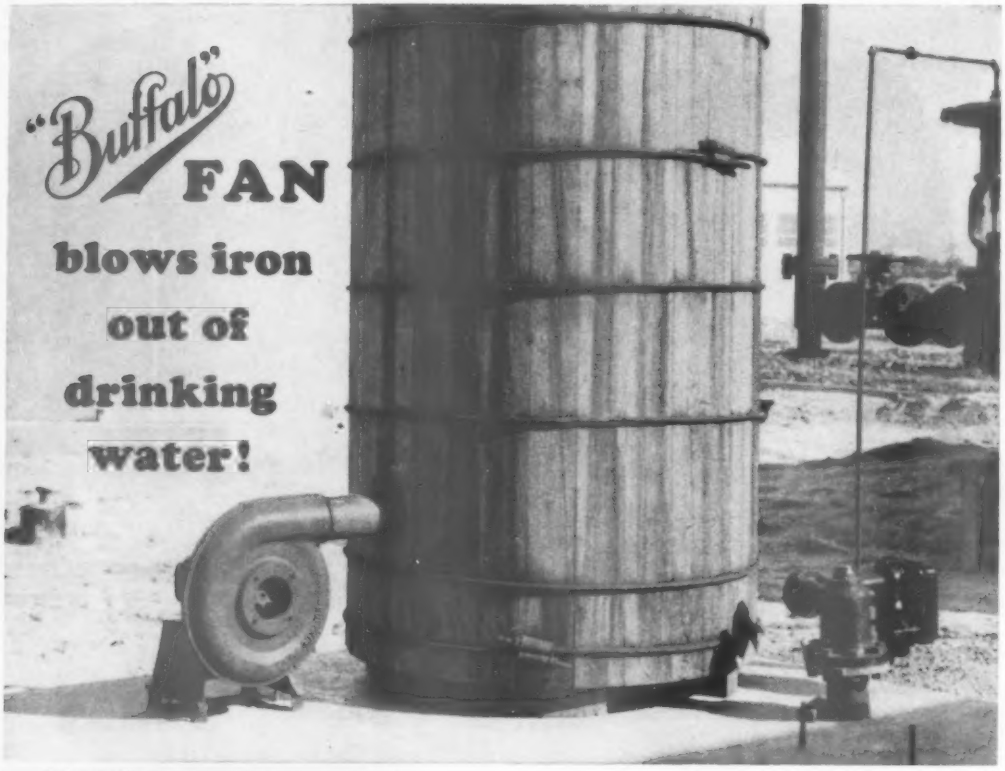
THE REMARKABLE SAFETY DEMONSTRATION DURING

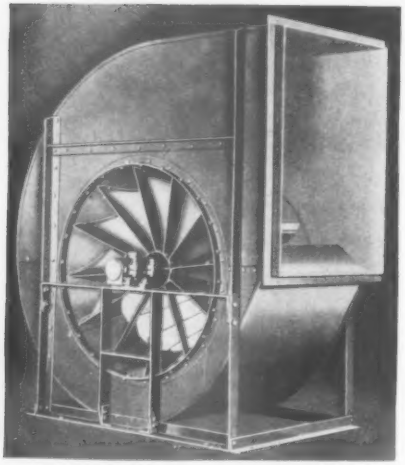
CROSS-COUNTRY SAFETY TOUR

• Starting August 18, at St. Paul, Minnesota, the colorful Warner truck-trailer begins its Cross-Country Safety Tour to present safety demonstrations at the principal cities shown on map at right. See your nearest Warner Electric Brake distributor for details and date of demonstration in your area.

FREE! **New factual folder "Six Steps to Better Braking for Truck Trailers." Get your copy now.**

Gives important tips on driver safety through synchronized braking. Explains the precise operation, simplicity of hook-up, amazing economy and added safety features of *electric* braking. Write today. Warner Electric Brake & Clutch Company, Dept. OGJ, Beloit, Wisconsin, U. S. A.





• This "Buffalo blower is aerating drinking water at a gas pipe line station in Marshall, Texas, to remove the iron content and make it more palatable. Month after month, this dependable little unit provides thirsty oilmen with cool, fresh-tasting water.

This pressure blower is only one of the many types of "Buffalo" fans giving dependable service in the oil fields. Pictured at left is the "Buffalo" LL Fan, famous for quiet, medium pressure service on the big volume jobs, such as exhausting fumes from huge engines in gas and oil line booster stations.

Whatever your needs in air handling, you'll find just the type you need in "Buffalo's" wide selection of models. Write today telling us your needs. We'll be glad to help solve your problems.

DIAMOND JUBILEE 75TH ANNIVERSARY

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

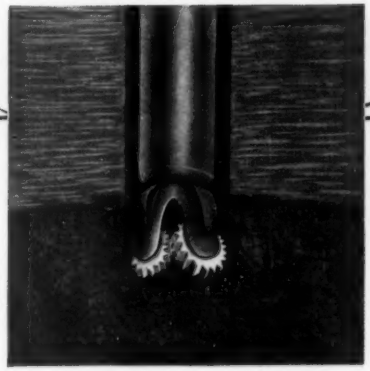
525 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING | PRESSURE BLOWING | AIR CLEANING | COOLING | AIR TEMPERING | HEATING | INDUCED DRAFT | FORCED DRAFT | EXHAUSTING

let's get to the POINT..

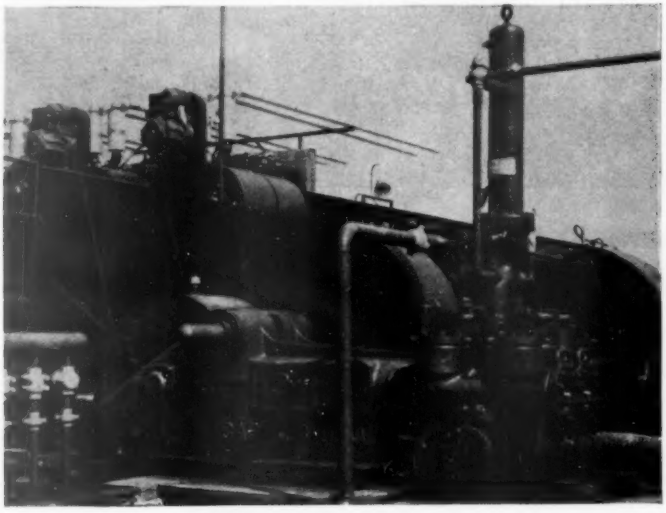


When your bit breaks into a new formation — whenever you want to send a new mud formula down the drill pipe fast—you'll be thankful for the extra reserve of stamina that's built into your GARDNER-DENVER SLUSH PUMP. Such as—

***Extra rigid main shaft*—solidly mounted in frame—hardened, ground and polished. Eccentric construction permits oversize diameter straight through, gives you a stronger pump.**

***Extra life eccentric bearings*—large areas and low unit pressures carry high plunger loads safely. Flood lubricated with continuous oil bath.**

***Extra heavy herringbone gears*—take sudden overloads safely and efficiently. Jackshaft floats in roller bearings to maintain perfect gear alignment.**



Gardner-Denver Slush Pumps are easily kept in tip-top shape, too!

Divided fluid cylinders simplify replacement—can be welded.

No connecting rod bolts to keep tight.

One-piece crosshead pin bearing eliminates tricky adjustments.

These and many other features facilitate maintenance in the field.

***Plus:* Gardner-Denver alloy high pressure fluid cylinders, rigid main frame, one-piece connecting rods, foolproof lubrication, positive mud protection, "telltale" liners. Made in NINE sizes, from 15 hp. to 750 hp. Write for complete specifications.**

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

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Export Division: 30 Rockefeller Plaza, New York, N. Y.
Republic Supply Co., (Of Calif.), 2600 S. Eastland Ave., Los Angeles, Calif.

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

CHASE ANTIMONIAL ADMIRALTY *(A patented alloy)*

If you want heat exchanger tubes that will stand up for years under tough conditions, remember... Chase Antimonial Admiralty* Heat Exchanger Tubes last longer! It's the antimony that does it!

These great heat exchanger tubes have enough antimony to resist dezincification. And antimony will not weaken the tube. The metal starts with the right grain structure and retains it... it stays tough and withstands the stresses of heavy duty assignments.

You'll do better with Chase Antimonial Admiralty Heat Exchanger Tubes! Send coupon for FREE Book.

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CHASE WAREHOUSE STOCKS:
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Also carried by
Vinson Supply Co., Tulsa,
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FREE CHASE BOOK discusses corrosion problems and selection of proper alloy for condenser and heat exchanger tubes.

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• The Nation's Headquarters for Brass & Copper

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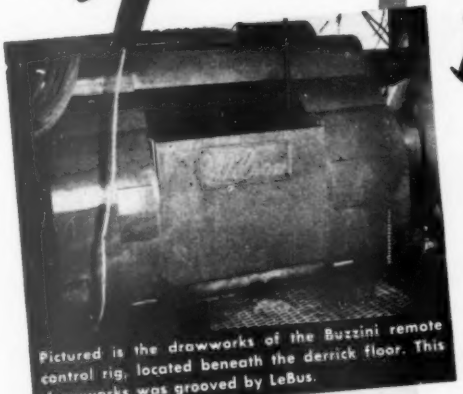
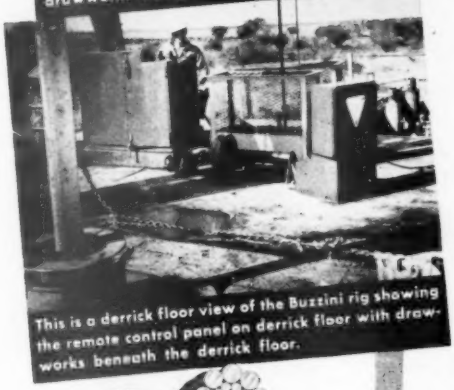
Baltimore	Dallas	Kansas City, Mo.	New Orleans	Rochester†	
Boston	Denver†	Los Angeles	New York	St. Louis	(†sales office only)
Chicago	Detroit	Milwaukee	Philadelphia	San Francisco	

4 Big Reasons Why...



Pictured is the drawworks of the Buzzini remote control rig, located beneath the derrick floor. This drawworks was grooved by LeBus.



This is a derrick floor view of the Buzzini rig showing the remote control panel on derrick floor with drawworks beneath the derrick floor.

Buzzini Drilling Co.

SAN ANTONIO, TEXAS

installed the LeBus Grooving & Wire Line Spooling System..!

The Buzzini Drilling Company, pioneer operators of Remote Control Drilling Rigs, are thoroughly convinced that by installing the LeBus Grooving and Wire Line Spooling System they have greatly added to the efficiency of their rigs. The four statements by Buzzini that follow show just how they have benefited by LeBus Grooving Installations.

1. The LeBus Grooving and Controlled Pyramid Wire Line Spooling System has benefited us most by smoothing out the wire line travel on the drum and by making it possible to cut off and change drilling lines more rapidly.

2. The LeBus system saves us valuable drilling time by allowing us to lower the pipe into the hole more rapidly plus the great saving in time when making line changes.

3. Our drilling and wire line costs have been reduced since using the LeBus System because we get additional wear on our wire line and our crews make their line cut offs at more regular intervals.

4. We now get more Ton Miles on our wire line since there is practically no cutting in, squeezing, pinching, and wire line whip.

LEBUS INTERNATIONAL ENGINEERS LIMITED

Executive Offices: 305 Wichita Natl. Bank Bldg., WICHITA FALLS, TEXAS
SALES, SERVICE Control and Warehouse Stock: LONGVIEW, TEXAS

Complete Sales & Service in Every Oil Center—Contact Your LEBUS REPRESENTATIVE For Full Information!

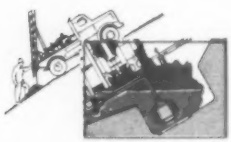
Fully Compensated Drive
—Multiple, free-acting differentials compensate for the differences in travel of all wheels. This reduces drive line strains, eliminates needless tire wear and scuffing.

Proper Weight Distribution
—Only a true 4x4 or 6x6 can give you the added weight on the front wheels needed for necessary traction to work in any footing, terrain, or weather.

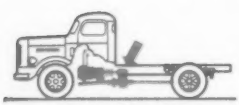
It's features like these that make FWD trucks

basically right for oil men!

There's an FWD for Every Job
—FWD models for Geophysical work, from the Light-Duty LD to heavy-duty 6x6 transporters, are dependable units, designed for rugged oil field service.



High Climb Oil Sump
—Keeps oil pump constantly submerged. Valuable in Geophysical service—prevents "oil starvation" of engine. An exclusive FWD feature that allows truck or truck-operated tools to work on steepest inclines or slopes.



Auxiliary Transmission
—Doubles the number of gear ratios...provides extra low gear ratios for work at extreme low speed. Available on all FWDs, as optional or standard equipment.

Get More Work Done At Less Cost Per Job...

Designed with the help of veteran oil men, FWDs have many performance-boosting features. An FWD will get supplies and equipment through where other rigs fail . . . handle more work per day, more jobs per year . . . cost less to service and maintain. Your FWD Dealer will be happy to give you all the facts on these versatile tools. Contact him or write direct to FWD. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. *Canadian Factory,* Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks

Johnson
SEA-HORSES
FOR DEPENDABILITY

Shown above is a drilling operation of the Arkansas Louisiana Gas Company, of Shreveport. The boat in the foreground is powered by a 10 hp Johnson Sea-Horse outboard motor.

This company has found outboard motors indispensable in their work—in transporting men and material—in making soundings and inspections—in reaching properties, wells, and mainline gates in high-water periods.

If you use boats in *your* operation, be sure to look into the money-saving, work-saving features of Johnson Sea-Horses. Be sure to see for yourself how these famous marine engines will take your boats where others dare not venture. And be sure to check outstanding Johnson features such as: Gear Shift (neutral, forward, reverse), 6-gal. Mile-Master Fuel Tank, Synchro Twist-Grip Speed Control, Neutral Clutch, Angle-matic Drive.

See your Johnson dealer. Look for his name under "Outboard Motors" in your classified phone book.

SEA-HORSE 10

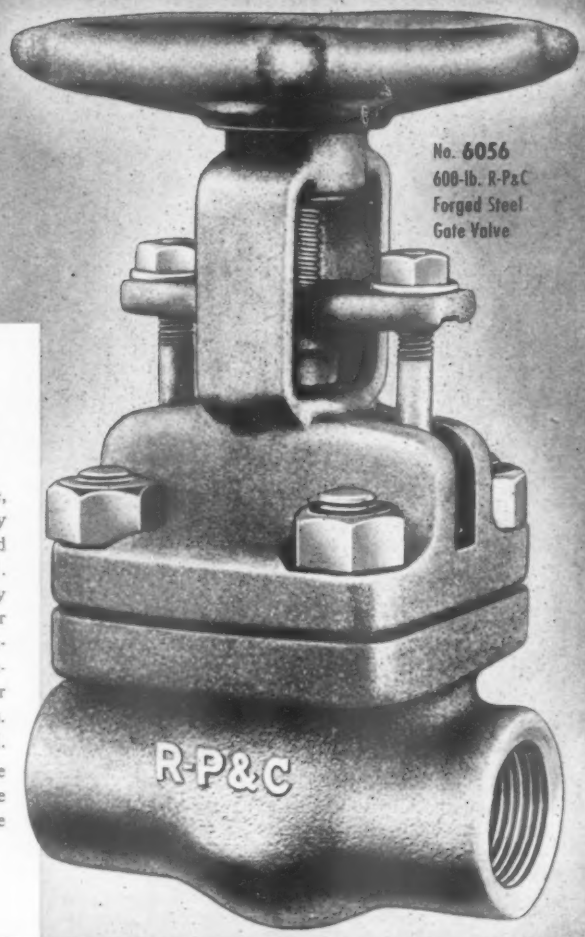
A 10 hp "work horse." With Gear Shift and separate 6-gallon Mile-Master Fuel Tank for hours of running without refueling.

FREE! Write for fully-illustrated literature on the 4 versatile Johnsons for 1952—ranging from 3 hp to 25 hp. A size for every outboard need!

JOHNSON MOTORS, 6600 Pershing Road, Waukegan, Illinois
In Canada: Mfd. by Johnson Motors, Peterborough

All hp is OBC *certified* brake hp at 4000 rpm.

an ACCO product



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600-lb. R-P&C
Forged Steel
Gate Valve

Premium Quality Features

• Body, bonnet, yoke, wedge, and hand-wheel of this sturdy R-P&C Gate Valve are forged steel. Wedge is heat-treated. Seating surfaces are smoothly ground and chromium plated for near diamond hardness. Stainless steel swinging gland eyebolts and nuts won't corrode or freeze. Furnished in $\frac{1}{4}$" to 2" sizes. Screwed, flanged, or welded end.

It's a premium quality valve but NOT premium priced. See your R-P&C distributor or write nearest R-P&C district office.

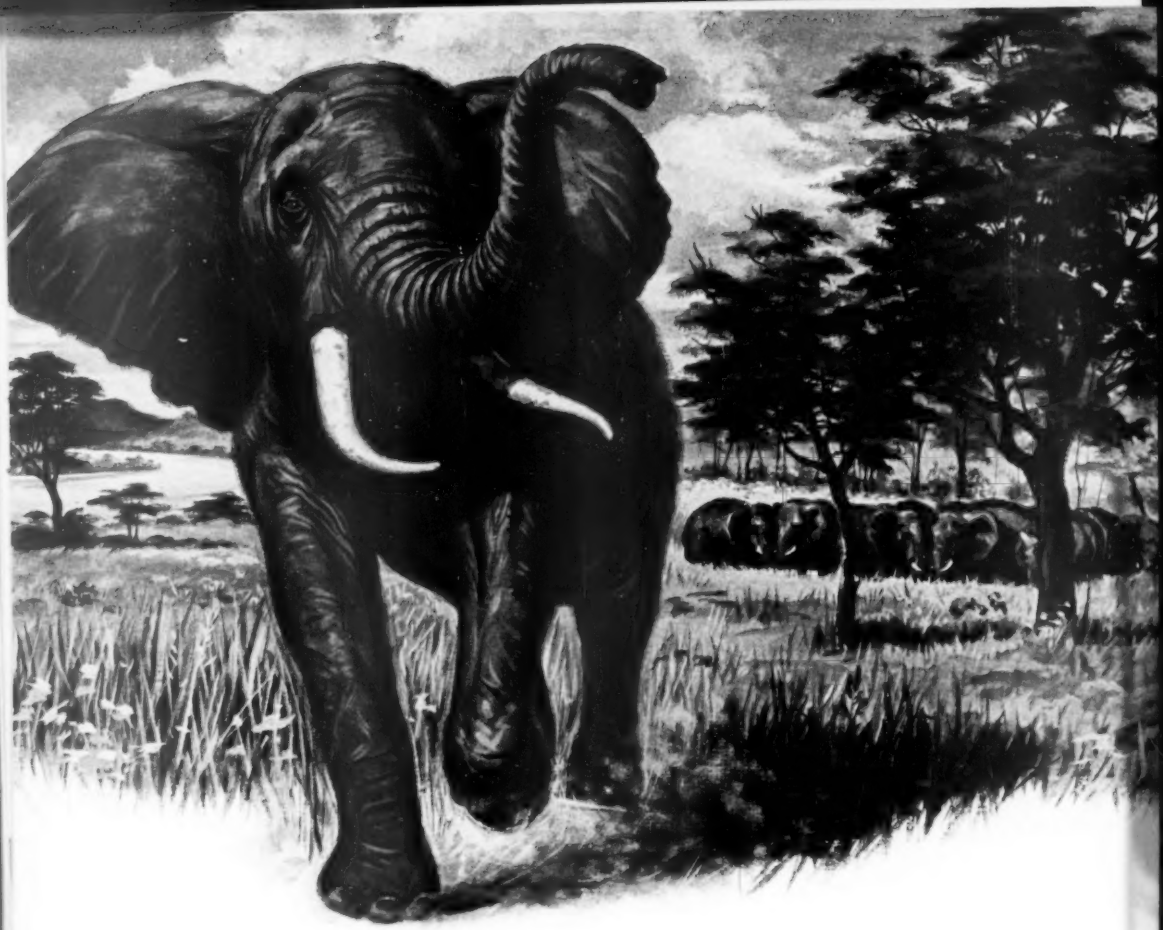
R-P&C valves

ACCO

TRADE MARK

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.



in WIRE ROPE, too, longer life depends on the RIGHT KIND of muscle

Massive, muscular structure gives the elephant the overpowering strength he needs to ward off the attacks of predatory enemies. Even in a hostile environment, these huge animals may stretch out their life span to well over a hundred years.

In wire rope, too, prolonged life is dependent on specialized muscles that will give best resistance to the destructive forces encountered... whether they be abrasion, bending fatigue, load strain or shock stress. That is why in Wickwire Rope we make sure that you get the right grade of steel and size of wire... the right construction and lay of the rope... in short, the right kind of muscle for your particular job.

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WICKWIRE ROPE

CF&I

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25 SERVICES

1 TRIP TO THE WELL

WHY OPERATORS PREFER SCHLUMBERGER!

Schlumberger Well Surveying Corp. • Houston, Texas

They Say—

Not Different Any More

"The 2-cent tax reduction on gasoline in Louisiana . . . is outstanding in some ways other than being a rarity because it is a tax reduction and even more of a rarity because it is a gasoline-tax reduction.

"The tax reduction, which Governor Kennon promised the voters, means that no longer will one state—it's been Louisiana for the last 4 years—stand out like a sore thumb with a startlingly high state gasoline tax rate.

"This is the first cut in the Louisiana gasoline tax rate. And in 20 years, only three other gasoline tax cuts are still in effect in the 48 states, as compared with 55 increases in state gas tax rates."

Editorial in the Shreveport Journal.

Too Small a Bribe

"The actual grievance of Mossadegh appears to be that the United States offered Iran only $10,000,000 as a gift.

"This, it seemed to the Iranian, was something like a bribe, and besides, that wasn't enough. The American view is that this country wants to end the very costly stalemate and prevent Iranian oil from becoming a pawn of war and possibly the eventual spoils for Russia.

"Somehow, Mossadegh cannot be made to see the oil situation in the light of cutting off Iran's nose to spite its face."

Editorial in the Tulsa World.

Everybody's an Oil Man

"President Truman, in an off-the-cuff remark at a press conference, said that there are a lot of people in Texas who do not own oil wells and are not privileged citizens. The implication of his statement was that many Texans have little interest in the oil-bearing off-shore lands historically belonging to the state and in the fight to preserve them against federal seizure.

"Mr. Truman's remark not only was off the cuff but far off the facts. . . .

"Every Texan is an oil well owner. Collectively, Texans are one of the world's largest owners of oil lands and royalties—exceeded only by some of the rulers in the Middle East and a few Western Hemisphere countries which are the owners of all their nationalized oil resources. Exclusive of the disputed off-shore lands, Texas

The Klemp Metal Grating Corporation has been serving the needs of the Oil Companies for almost half a Century. During this time Klemp has produced and patented several specialized gratings such as Hexteel and Floorsteel for ganister linings in the Refining Division of the Oil Industry.

Klemp Welded Steel and Diamond Riveted Grating are consistently specified for stair treads, walkways, landings, tower stairs, catwalks, stairways and many other applications to insure —

- *Fireproof Non-Slip Footing for Men and Traffic.*
- *Efficiency with Safety.*
- *Protection Plus Comfort Through Complete Ventilation.*

For 45 years the Klemp Metal Grating Corporation's engineers have specialized in the fabrication of gratings and open steel meshes only. This specialized experience is at your service. Factories are centrally located in Chicago and Houston.

We solicit the opportunity to solve your most difficult flooring problems. Send in your blue prints for quotations today.

All types of Klemp Open Steel Gratings are available for immediate shipment.

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EASIEST WAY TO MAKE ENDS MEET

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"Vic-Groover" Tools save time, save money, are an important feature of the famous Victaulic Method. These portable, easy-to-operate pipe groovers prepare pipe ends easily and quickly right on the job to receive Victaulic Couplings and Fittings!

The *complete* Victaulic Method comprises: easy-to-install Victaulic Couplings for assured leak-proof connections and a union at every joint . . . a complete line of Full-Flow Elbows, Tees, Reducers, and other modern Fittings that offer wide adaptability and versatility . . . and, of course, unique, fast-working "Vic-Groover" Tools.

Why not give the Victaulic Method a tryout on *your* next piping job? You'll find that mis-alignments, expansion and contraction are automatically taken care of with Victaulic and you'll have assured lock-joint, leak-proof piping!

For new construction . . . repairs . . . alterations, use the VICTAULIC METHOD . . . *it's the easiest way to make ends meet!*

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28th VICTAULIC YEAR

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citizens jointly own 15,101,125 acres of land, much of it either producing oil or under lease for oil development.

"For the most part, these lands belong to the state's public school fund and the University of Texas permanent fund, under a far-seeing constitutional provision which thus created a rich endowment for public education in Texas, and to the state prison system, the eleemosynary institutions, and other agencies of the state. Acting for the people in the administration of these properties are state boards created by the Legislature. At present there are in effect more than 8,000 leases for development of the minerals underlying the state-owned lands."

Editorial in the Fort Worth Star-Telegram.

New Readers

Sir:

"Thanks for your August 18 editorial reference to the Desk and Derrick convention in Houston.

"Not only are oil men reading The Oil and Gas Journal, but now oil women too, and we have found that the oil industry is a vast and interesting field, but we have much to learn. As for that front seat, I think we are satisfied to let you do the driving—but we just want to see where we are going."

Thelma Aldridge, editor
Petroleum's Petticoat Journal
Odessa Desk and Derrick Club
Odessa, Texas.

CALENDAR

OCT.

1- 3 American Institute of Mining and Metallurgical Engineers, Mid-Continent fall meeting, Rice Hotel, Houston.

1- 3 National Association of Corrosion Engineers, South Central Region, technical program and committee meetings, Jung Hotel, New Orleans.

2-3 Petroleum Electric Power Association, annual conference, Mayo Hotel, Tulsa.

3- 5 New Mexico Geological Society, annual field conference, Santa Fe.

4 John Zink Process Heating seminar, John Zink Co. plant, Tulsa.

6 Independent Natural Gas Association of America, annual meeting, Fontenelle Hotel, Omaha, Neb.

6 Natural Gasoline Association of America, school on low temperature fractional analysis of petroleum gases and liquids, University of Oklahoma, Norman.

9-10 California Natural Gasoline Association, twenty-seventh annual fall meeting, Ambassador Hotel, Los Angeles.

11 American Institute of Chemical Engineers, Oklahoma section, Tulsa University.

12-18 Oil Progress Week.

13-15 Texas Mid-Continent Oil and Gas Association, thirty-third annual meeting, Hotel Texas, Fort Worth.

PROOF...

of CONFIDENCE in the performance of

PARKERSBURG

Single tube Horizontal Separators

• Three railroad flat cars are required to fill this single order for Parkersburg Large Single Tube Horizontal Separators, shown leaving our Houston Plant.

The Large Single Tube design assures:

1. SLOWER GAS FLOW to permit more effective, natural separation;

2. GREATER INTERFACE AREA for more thorough and complete degassing;

3. LONGER RETENTION TIME allows more time for oil to give up its gas.

• Ask your Parkersburg Representative about these three basic factors of maximum horizontal separator performance.

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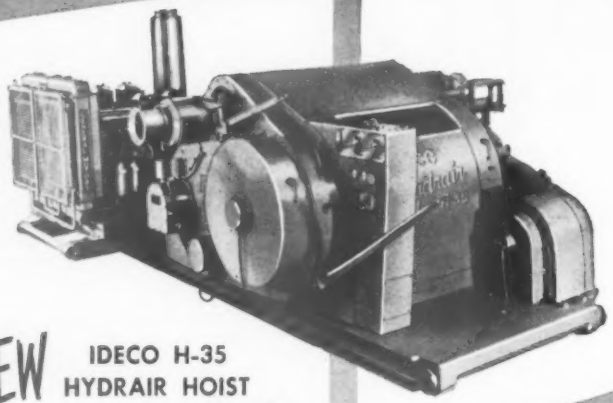
PRESSURE EQUIPMENT

HORIZONTAL AND VERTICAL SEPARATORS • HYRECO • HYDRACEPTER • SCRUBBERS • TREATERS • HEATERS

Manufactured in Houston, Texas



NEW IDECO H-35 HYDRAIR HOIST

DRILLS 4,500 FEET DOWN

IDECO's new H-35 Hydrair Hoist is a torque converter equipped rig for drilling to 4,500 feet and for workover or servicing to 16,000 feet.

Two models are available, each incorporating every modern design feature to provide rugged, trouble-free performance. A three-speed rotary transmission is available to give an adequate range of rotary speeds when the rig is equipped with a pump drive. Features include totally enclosed oil bath lubrication of all chain drives; optional high-speed hydromatic or dynamatic brake; long main and upper drums; cut-out clutch to disconnect the catshaft when drilling; full torque converter performance.

The H-35 is available as a single-engine or two-engine rig; either skid mounted or as a trailer mounted Rambler Rig.

SKF

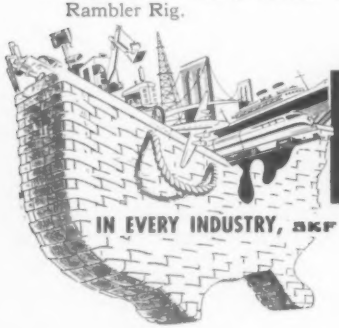
HELPS KEEP ITS PERFORMANCE UP

IDECO's new rig is equipped with SKF Spherical Roller Bearings on the input shaft, main drum shaft, cathead shaft, hydromatic brake shaft and countershaft. The sprocket hubs are equipped with SKF Deep Groove Ball Bearings.

You'll find SKF Sphericals the most popular bearing with drilling rig designers because they know from long experience that they're the best ever developed for heavy-duty applications for carrying combined radial and thrust loads, even where shaft misalignment exists.

SKF Deep Groove Ball Bearings are an old oil-field standby, too—dependable always for carrying combined radial and thrust loads.

SKF INDUSTRIES, INC., PHILA. 32, PA.
—manufacturers of **SKF** *and* HESS-BRIGHT *bearings.*



SKF®
BALL AND ROLLER BEARINGS

IN EVERY INDUSTRY, SKF Puts The Right Bearing In The Right Place

13-17 American Institute of Electrical Engineers, fall meeting, New Orleans.

16-17 Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.

16-19 Permian Basin Oil Show, Odessa, Tex.

20 Texas Independent Producers and Royalty Owners Association, mid-year directors' meeting, Austin.

20-23 Society for Non-Destructive Testing, Inc., annual meeting, Hotel Sylvania, Philadelphia.

22-24 Society of Automotive Engineers, national transportation meeting, Hotel William Penn, Pittsburgh, Pa.

23-24 American Institute of Mining and Metallurgical Engineers, petroleum branch, West Coast fall meeting, Statler Hotel, Los Angeles.

23-24 Independent Petroleum Association of America, annual membership meeting, Skirvin Hotel, Oklahoma City.

24 Institute of Gas Technology, annual meeting, Chalfonte-Haddon Hall, Atlantic City.

24 Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.

27-28 Society of Exploration Geophysicists, Eastern Canada meeting, King Edward Hotel, Toronto, Ont.

27-31 American Gas Association, annual convention. Atlantic City, N. J.

30-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, annual fall meeting of Pacific sections, Statler Hotel, Los Angeles.

30-Nov. 1 Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver.

NOV.

3- 4 Society of Automotive Engineers, national diesel engine meeting, Chase Hotel, (tentative), St. Louis, Mo.

5- 7 Industrial Management Society, 16th annual time and motion study and management clinic, Sheraton Hotel, Chicago.

6- 7 Society of Automotive Engineers, national fuels and lubricants meeting Mayo Hotel, Tulsa.

6- 8 Gulf Coast Association of Geological Societies, annual fall meeting, Hotel Driscoll, Corpus Christi, Tex.

8-13 Oil Industry Information Committee, Conrad Hilton Hotel, Chicago.

10-13 American Petroleum Institute, thirty second annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

13-14 Society of Exploration Geophysicists, midwestern meeting, Texas Hotel Fort Worth.

17-18 American Institute of Electrical Engineers, subcommittee on electrically operated recording and controlling instruments, technical conference Benjamin Franklin Hotel, Philadelphia.

20-21 National Association of Corrosion Engineers, western region, second annual corrosion conference, Biltmore Hotel, Los Angeles.

20-22 Instrument Maintenance Short Course jointly sponsored by Southern California Meter Association and Los Angeles Harbor Junior College.

21 Natural Gasoline Association of America, district meeting, Herring Hotel Amarillo, Tex.

30-Dec. 5 American Society of Mechanical Engineers, Statler Hotel, New York City.

With an economical, portable Baker Hydraulic Hand Pump you can test valves and fittings, operate blow-out preventers and remove cores. ★ Handy for dozens of other uses in field or shop. ★ Develops up to 6,000 psi—weighs only 68 pounds—is easy to operate—costs mighty little, and lasts for a long time. ★ The nearest Baker man will get one for you promptly, or write to Baker Oil Tools, Inc., at Houston, Los Angeles, or New York.

An Investment in

Ampco* Safety Tools

pays BIG dividends in Fire Prevention

Look for the DANGER SPOTS in your plant — spray booths, inflammable liquid storage areas, etc. It doesn't take much to start a fire there—one that will turn your property into a blazing inferno That's why a small investment in Ampco Safety Tools is low-cost insurance.

Factory Mutual Laboratories and other safety authorities know that ordinary tools can mean real danger in hazardous locations. That's the reason they approve and recommend Ampco Safety Tools for use in such areas. Invest now

It's easy to choose the right safety tool for your job

More than 400 tools

For tools subject to impact and/or torque — specify tools of Ampco Metal.

For jobs around acetylene and similar gases—specify Ampco Monel† Tools.

For tools with cutting edges or gripping teeth — specify Ampco beryllium copper Tools.

†T. M. International Nickel Co.

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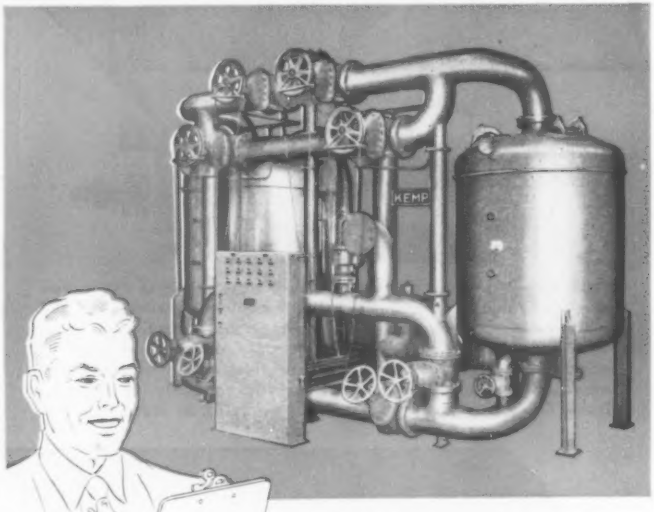
T-7A

West of the Rockies, It's Ampco Burbank Plant, Burbank, Calif. • In Canada—Safety Supply Co., Toronto, Ont.

There's a KEMP DRYER for every Moisture Problem



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DRIED—Dries air used to actuate tools, valves, instruments, etc., where drying requirements are moderate.

RADIATION COOLED—For small or medium flow rates. Offer low operating cost with maximum efficiency.

CONVECTION COOLED—Provide continuous drying capacity of air and gases at minimum cost.

*All of above in complete range of sizes with manual, semi-automatic or fully automatic operation.

Dry air, gases, liquids to sub-zero dew points . . . at minimum cost

Quality, diversity, flexibility, economy . . . four good reasons why Kemp Dynamic Dryers offer you the *best* solution for *any* moisture problem. Kemp superiority of design and engineering know-how is your assurance of *dependable, low-cost* performance whether you dry air, gases or liquids. Many Kemp users report drying to sub-zero dew points for as little as ¼c per mcf—including all charges for labor, capital investment and materials. In addition, Kemp guarantees operation of every unit to meet your specifications.

Kemp Engineering Versatile

Gas, electric or steam regeneration is standard equipment with every Kemp Dynamic Dryer . . . with or without cooling units. Also, depending on your needs, you have a choice of manual, semi-automatic or fully automatic operation. In every instance, Kemp will specify the proper dessiccant suitable for your operation. Chances are there is a standard Kemp design that is ideal for your plant and saves you money too. It costs you nothing to investigate.

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For technical information and facts on how Kemp Dryers can solve your moisture problems, write for Bulletin D-27 to:

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CARBURETORS • BURNERS • FIRE CHECKS • ATMOSPHERE & INERT GAS GENERATORS
ADSORPTIVE DRYERS • METAL MELTING UNITS • SINGEING EQUIPMENT • SPECIAL EQUIPMENT

DEC.

1- 3 New Mexico Oil and Gas Association, annual meeting, Albuquerque.

1-6 American Society of Mechanical Engineers, twentieth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York.

5- 6 Interstate Oil Compact Commission, winter meeting, Wichita, Kans.

7-10 American Institute of Chemical Engineers, annual meeting, Hotel Cleveland (Hqs.) and Carter Hotel, Cleveland.

1953

FEB.

2- 4 Missouri Petroleum Association convention, President Hotel, St. Louis.

27 Natural Gasoline Association of America, regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

2- 6 American Society for Testing Materials, spring meeting, Statler Hotel, Detroit.

4- 6 American Petroleum Institute, division of production, Southwestern district spring meeting, Hilton Hotel, Fort Worth.

8-11 American Institute of Chemical Engineers, Buena Vista Hotel, Biloxi, Miss.

15-17 American Petroleum Institute, division of production, Eastern district spring meeting, William Penn Hotel, Pittsburgh.

16-20 National Association of Corrosion Engineers, Hotel Sherman, Chicago.

18-20 American Petroleum Institute, division of production, Mid-Continent district meeting Mayo Hotel, Tulsa.

23-26 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists, annual meeting, Rice and Shamrock Hotels, Houston.

30-31 Texas Independent Producers and Royalty Owners Association, annual meeting, San Antonio.

30-Apr. 1 Mid-West Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

APR.

8-10 American Petroleum Institute, division of production, Eastern district meeting, William Penn Hotel, Pittsburgh.

15-17 National Petroleum Association, midyear meeting, Cleveland.

21-23 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

26-29 American Institute of Chemical Engineers, Chemical Institute of Canada, joint meeting, Royal York Hotel, Toronto, Ont.

27-28 Independent Petroleum Association of America, mid-year meeting, Jefferson Hotel, St. Louis.

Apr. 29-May 1 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

MAY

4- 5 American Petroleum Institute, division of marketing, midyear meeting, Baker Hotel, Dallas.

11-13 Southern Gas Association, Jung Hotel, Hotel, New Orleans.

14-23 International Petroleum Exposition, Tulsa.

24-27 American Gas Association, production and chemical conference, Hotel New Yorker, New York City.

28-29 Natural Gas and Petroleum Association of Canada, London, Ont.

"When power is needed, Dodge trucks have it!"

...says **C. R. SHEARMAN,**
Hood Construction Co., Lynwood, Calif.

"We've been big Dodge users for many years, because our business demands trucks that are dependable, economical and rugged.

"We do most of our driving over rough ground, a lot of it in the mud. The trucks work with crews who are laying pipe in the field. This kind of hauling calls for plenty of power to carry equipment to the men.

"And when power is needed, Dodge trucks have it! They seem to be able to pull anything."

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Best of all, there's a Dodge "*Job-Rated*" truck that fits your job to a "T." On 1½-ton "F" model through 2-ton HH model G.V.W. ratings from 10,500 lbs. through 16,000 lbs., 9-ft., 12-ft. and 14-ft. stake or platform bodies—128″, 152″ and 170″ wheelbases on many models, plus 192″ on 2-ton models. And in the 1½- and 2-ton conventional models, a big 236.6 cubic-inch engine that develops 109 gross horsepower.

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JOURNAL
TULSA, OKLAHOMA

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JOURNALLY Speaking

Superior Test

WE in this corner have long felt that while the Big Yellow Book can't be all things to all people, it nevertheless can and does provide a number of special services for its readers. Now, in this annual drilling-contractors' issue, we proudly take the wraps off another first.

Want to know how you rate (or would rate) as a drilling supervisor? It won't cost you a time-consuming trip to a psychoanalyst, plus $100—or $10—or even $1. As a matter of fact, it will only cost you a little time. Just turn to page 172, read the simple directions, sharpen your pencil, scratch your head, and go to work.

Then have two or three people who work with you give you anonymous ratings using the same questions. Take this seriously and we think you can improve your supervising immeasurably.

Drillers, Don't Read This!

SURE this big book is crammed full of statistics and facts earmarked for the drilling contractor and the driller. We've worked all year to make this issue one that drilling people just can't do without.

BUT, don't go away if you don't know the shale shaker from the traveling block. Turn to page 167, wrinkle your brow, and try to look intelligent as you match names with the numbers on the rotary rig. If you really get stuck, you might peep at the answers on page 294.

After you have finished (and fudged enough right answers to soothe your ego), find your drilling friends and tell them that now you know how to keep the crown block from jumping the draw works into the mouse hole and ending up in the settling pit.

Want To Be a Contractor?

NOTHING to it—it's easy. You, too, can drive one of those long, sleek, black cars that hinges in the middle and gets gallons to the mile. All you have to do is be able to say "yes" to these simple qualifications. Then we'll give you some more—equally simple.

Have you had 10 years' experience in all phases of rotary drilling?

Have you dealt with oil-company people who specify drilling requirements and let contracts?

Have you ever hired and supervised people and met a payroll?

Have you saved enough money to last some people a lifetime, and do you have collateral to borrow considerably more?

Have you imagination, energy, and initiative?

Are you willing to work long hours; can you fight down discouragement and keep plugging?

Have competitors left an opening: can you compete on service, or quality of equipment, or price?

Is your personal situation right for the plunge: your age, present job, future prospects, family responsibility?

Nothing to it—it's easy.

What Is a Driller?

FROM the Southern Production Co. "Southerner" comes this question and an answer that will bring a grin and rueful head shake, for it's all too true.

"A driller is a man who has more problems than any other person. If he works his men hard, they say he is a chicken. If he lets them loaf he is run off. If he has a good crew, 10 men a day ask him for a job, but if he needs a good man, he can't find one high or low.

"If he makes a round trip his crew says he's an eager beaver, but if he drills 8 hours his relief says he's lazy. If he makes a lot of hole, he is accused of setting the blocks on the kelly, but if he doesn't make much hole he is called a weevil.

"If he goes out with the boys he is in trouble when he gets home, but if he doesn't go out with the boys he is a high hat and thinks he is too good to run around with his crew."

Gerald L. Farrar.

Stop Trouble before it starts...

Baker "BAKWIK" Drill Pipe Float Valve Assemblies are "standard equipment" with a large majority of drilling contractors and the drilling departments of oil companies. They *know* that the inexpensive BAKWIK Drill Pipe Float Valve is saving money for them *during all drilling operations* and is *low-cost insurance against serious accidents.*

BAKWIK SAVES MONEY FOR YOU because it—PREVENTS PLUGGING THE BIT with the danger, lost time, and the annoyance of pulling wet strings—RELIEVES WEIGHT ON DERRICK and other rig equipment because it "floats" the drilling string—LENGTHENS LIFE OF WIRE LINES AND BRAKE BANDS due to the reduced weight of the drilling string, which is "floated" in—DOES NOT INTERFERE WITH DRILLING because the valve can be quickly lifted out of the string and just as easily replaced. And BAKWIK is an "Ace in the Hole" to MINIMIZE OR PREVENT SERIOUS DAMAGE in event the drilling string should part while running-in or coming-out of the hole.

NO TROUBLE TO INSTALL OR REMOVE—Many operators install the Baker BAKWIK Drill Pipe Float Valve Assembly in a valve chamber in the drill collar, where it is held in place by the pin on the drilling bit—see illustration. Or it can be positioned in a Baker Model "B" Drill Pipe Float, Product No. 480, at any point in the drilling string, held in place by the tool joint pin.

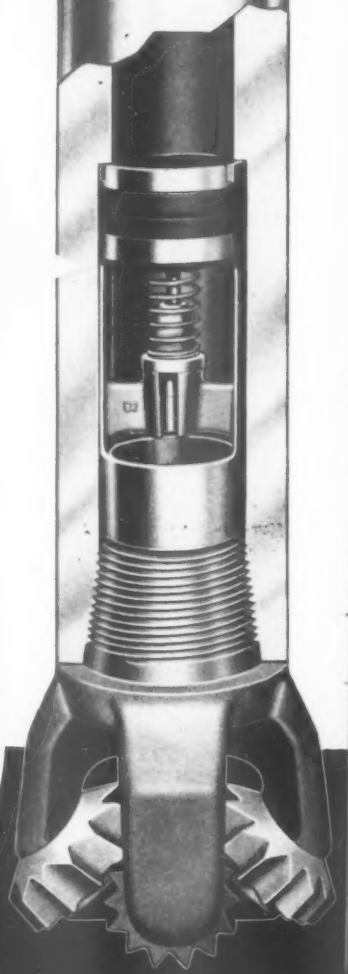
The strong, simple valve assembly is made entirely without threads and is merely dropped into place by hand. No tools or wrenches are required to install or remove. When an unrestricted passageway is desired, the valve assembly is lifted out, and surveying instruments, or other devices can be run through the drill pipe.

SERVICED ON THE DERRICK FLOOR—The inexpensive wearing parts are available at your supply store, and are quickly and easily installed on the rig. The four illustrations show how simple it is to replace the valve seal.—You'll wonder how BAKWIK can *do* so much, *save* so much, and *cost so little*—so *order one today* from your supply store.

BAKER OIL TOOLS, INC.

Los Angeles • Houston • New York

To install new Valve Seal—after long service—in less time than it takes to tell it, you merely (1) press small portion of valve seal down to fit matching groove in valve head; then (2) pull rest of seal parallel to upper edge of groove; (3) pull seal just below groove; press small section at a time into groove. Roll on bench, applying pressure, until the seal fits perfectly as in view (4).



It's the **BAKER BAKWIK DRILL PIPE FLOAT VALVE**

PRODUCT NO. 481

Take a look at demand— it may level off

THE time has come for the oil industry to take a good, hard look at the probable demand for its products during the coming year or so. The present situation poses the possibility that the market may not absorb quite as much as the industry is prepared to supply.

This is pointed up by the recent flurry over the supply of furnace oil for the East Coast for the coming winter. The Petroleum Administration for Defense, quite properly, considers that its first duty is to make sure that consumers have adequate supplies of petroleum products. To this end it publicly urged refiners and distributors to build up big stocks there.

Industry objected to the note of urgency in this request, pointing out that some recent shortages have not been due to lack of supply but because a few dealers took more contracts than they could fill from their storage or service with their trucks. It also pointed out that anxiety to stock up one area with one product could result in general overproduction of associated products and a clogging of storage so that refinery runs might have to be cut back, thus resulting in the output of less furnace oil during the actual heating season.

BUT quite aside from the East Coast heating problem, the whole supply and demand picture needs to be brought into sharper focus.

After the postwar recovery, about 1948, oil and most of American industry reached a "maturity," a period of only gradual growth. Since then three events have unexpectedly upset the supply-demand balance of petroleum products: The Korean war in 1950, the Iranian shutdown in 1951, and the refinery strike of last May.

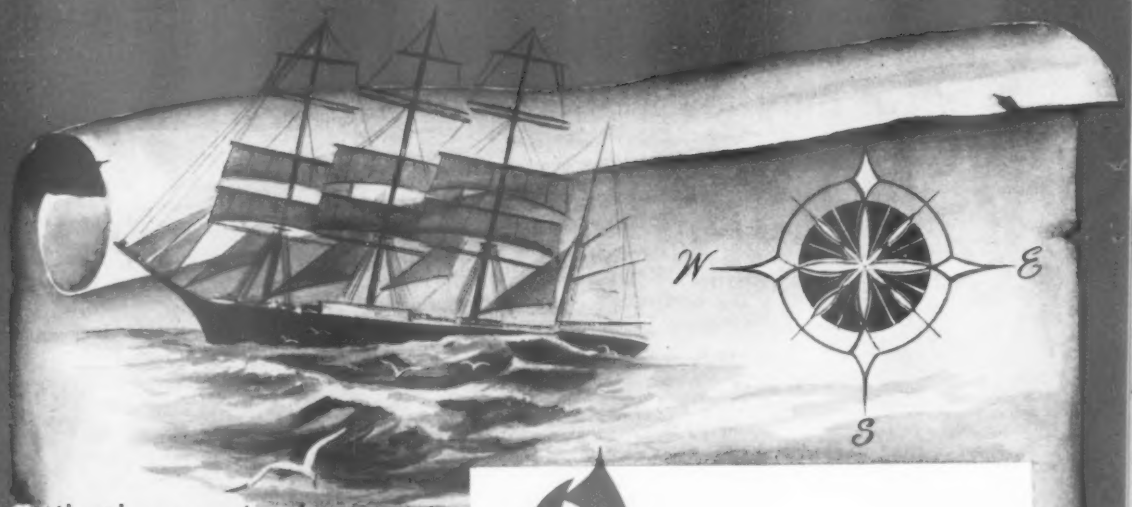
Now, in the absence of some new emergency, the oil industry is about back to normal again, "normal" meaning demand increases of about 3 to 5 per cent a year in place of the 8 to 10 per cent increases of the past couple of years. Except for aviation gasoline, which is a special problem, the industry should have no trouble in meeting all demands.

THERE is no reason for pessimism in this situation. A market which grows 5 per cent a year is certainly not a depression. But if production goes up 10 per cent while demand increases only half that, somebody is going to get caught with a lot of slow-moving stocks.

During every cycle of changing demand, whether up or down, some people usually get panicky. At one time there is alarm over shortages and at another there is fear of a glutted market. And usually some operators get left on the wrong side of the trend.

All that is needed now, or at any such period of shift in the supply-demand picture, is cold-eyed, objective study of the statistics which are available to all.

MERCHANTS OF PETROLEUM PRODUCTS



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Let Anchor chart your course to profit...

Our every activity revolves around the business of helping our suppliers and customers make a profit on their association with us . . . Our reputation in the petroleum field is proof that we are accomplishing our aim. Give us the opportunity to help chart your course in the direction of profit.

ANCHOR

PETROLEUM COMPANY

TULSA

SALES OFFICES: DES MOINES, OMAHA, TOLEDO, HOUSTON, LOS ANGELES

THIS WEEK

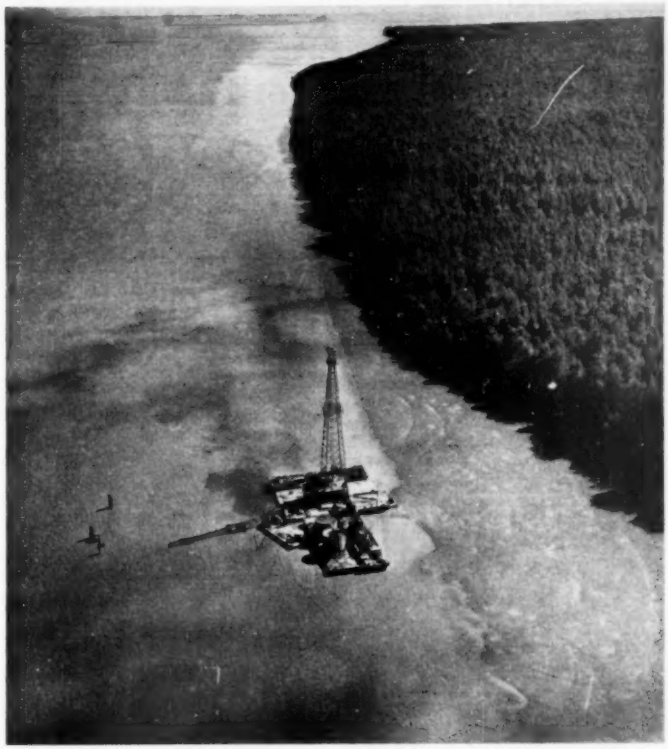
PRODUCTION.—Texas Railroad Commission sets new all-time high crude-production allowable for October of 3,268,813 bbl. daily. . . . Producing days for state generally will be 23 (up 1 from September). . . . East Texas field will be allowed only 18 (down 1) due to a 3 psi. drop in reservoir pressure. . . . ¶Louisiana, too, hikes its allowable for October by about 2,740 bbl. daily to total 681,946 bbl. daily. . . . ¶T. W. Murray sells one-fourth interest in 36 producing wells in Fort Chadbourne field of northwestern Runnels County, Texas, to N. P. Powell, of Tyler, Tex., for $1,600,000.

PIPE LINES.—Northern Natural files $70,000,000 program with FPC asking authority to increase its capacity 300,000,000 cu. ft. per day. . . . Project would involve 442 miles of main lines . . . ¶New method of controlling suction and discharge pressure in pump stations described at A.S.M.E. meeting. . . . Method uses modified hydraulic engine governor to give more effective, and yet simpler and less expensive, control of these variables. . . . ¶Transcontinental announces completion of compressor program increasing its daily capacity to 555 M.M.c.f.

INTERNATIONAL. — Monthly Journal survey shows free-world production in July declined sharply to 11,110,700 bbl. daily—off nearly 2 per cent from figures in June. . . . United States production was down about 107,000 bbl., Venezuela 21,000 bbl., Iraq 81,000 bbl., and Saudi Arabia 48,500 bbl. daily. . . . ¶W. Alton Jones, of Cities Service, says his trip to Iran was made to see if he could be "of any assistance in getting the Iranian oil industry back into operation." . . . He claims to have made no deal but indicates he might be willing to buy oil from Iran regardless of British threats. . . . ¶Mossadegh formally answers joint British-American settlement offer by renewing his demand that Iran be paid $137,200,000. . . . ¶Work is launched on expansion and modernization of the Antwerp refinery operated by "Albatros" S.A. Belge pour de Raffinage de Petrole. . . . Expansion involves extension of distillation facilities, and installation of a Houdriflow unit and cat poly plant. . . .

STEEL.—Carbon-steel allocations for the first quarter of 1953 will be one-fourth under those of this year's fourth quarter. . . . Oil-country tubular goods will get same amount of steel, but all other uses will be given less, resulting from lower allocation by DPA. . . . ¶Steel-industry capacity for turning out tubular goods is rising. . . . J. Ed Warren tells West Virginia meeting 1953 fourth-quarter capacity will be 540,000 tons, compared with 1952 last-quarter capacity of 465,000 tons. . . .

REFINING.—Process for converting acid waste and waste ammonia into profitable ammonium sulfate described in paper presented at A.S.M.E. meeting. . . . New process minimizes refiners' old waste-disposal problem. . . . ¶Canadian Oil Refineries, Ltd., formally opens 20,000-bbl. refinery at Sarnia, Ont. . . . British American in same week officially opens its expanded and modernized 15,000-bbl. refinery at Moose Jaw, Sask. . . .

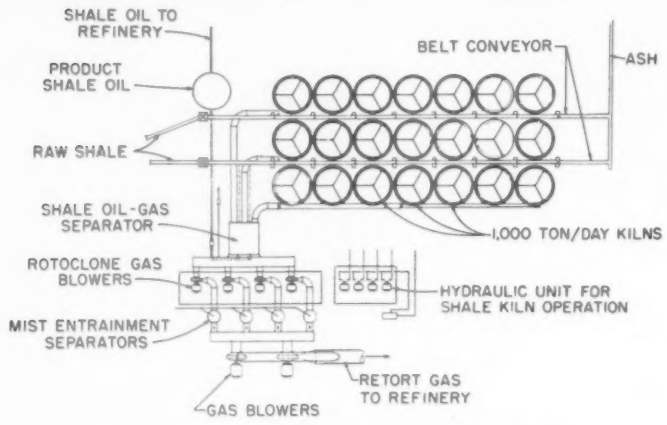


GULF OF PARIA WILDCAT is this well being drilled by Creole Petroleum Corp. in Venezuela. Located on the mud flats just off the coast in the Pedernales area, the well illustrates just one of the many handicaps which the drilling industry must overcome in its constant exploration for new reserves to supply the world's growing demand. Problems of the drilling industry will get a going over this week in Oklahoma City at the annual meeting of the American Association of Oilwell Drilling Contractors.

TRENDS.—Distillate stocks reached the all-time high of 112,472,000 bbl. on September 20. . . . Distillate inventories normally reach a peak late in October or early in November. . . . Distillate production has been greater than 10,000,000 bbl. per week for 14 out of the last 15 weeks. . . . Stocks have gained 58,800,000 bbl. in the past 15 weeks compared with a gain of 40,800,000 bbl. in corresponding period last year. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,506,850 bbl. daily for week ended September 20, up 50,700 bbl. daily. . . . ¶Total well completions were up 23 wells to 822 for the week. . . . ¶Wildcat completions totaled 203, up 11 from previous week but down 18 from same week last year. . . . ¶Rotary rigs operating in United States on September 22 represented a gain of 52 rigs for the week to reach 2,449. . . .

Plan of 20,000-Ton per Day Shale Retorting Plant



Designing for Shale Oil

Union Oil Co. engineers describe a potential 20,000-ton commercial operation; extent of shale reserves outlined

Kenneth B. Barnes

KANSAS CITY.—Design of a shale-oil layout capable of mining and retorting 20,000 tons of shale a day, together with an analysis of this country's enormous shale-oil reserves, was presented here last week at the American Society of Mechanical Engineers meeting.

Engineering features of Union Oil Co. of California's new shale retort were described by Homer C. Reed, chief engineer, and Clyde Berg, manager of the company's development department. The company first unveiled in 1950 its novel, underfeed retorting method in a 50-ton per day unit.

The authors estimated that a typical commercial shale mine could produce about 20,000 tons of shale per day. On this basis, they presented the design of a typical plant which could handle this production.

Such a layout, they said, would employ a battery of retorts, each having a capacity of 1,000 tons of shale per day. The design calls for a centralized gas-handling system and for centralized hydraulic power-supply equipment.

The Union Oil retorting unit employs countercurrent flow of shale and air in a kiln utilizing bottom feed of solids. Ash and clinkers are removed overhead. The oil drained from the bottom of the unit is cooled by countercurrent heat exchange with the incoming shale. No water is required for process operation. Movement of the shale through this unit is effected by a hydraulically operated underfeed mechanism. Fusion of ash is not a problem since special sodium-filled plows carry out a scraping action in the plastic ash fusion zone.

Yield data for an operation processing 20,000 tons per day of shale averaging 30 gal. per ton would be:

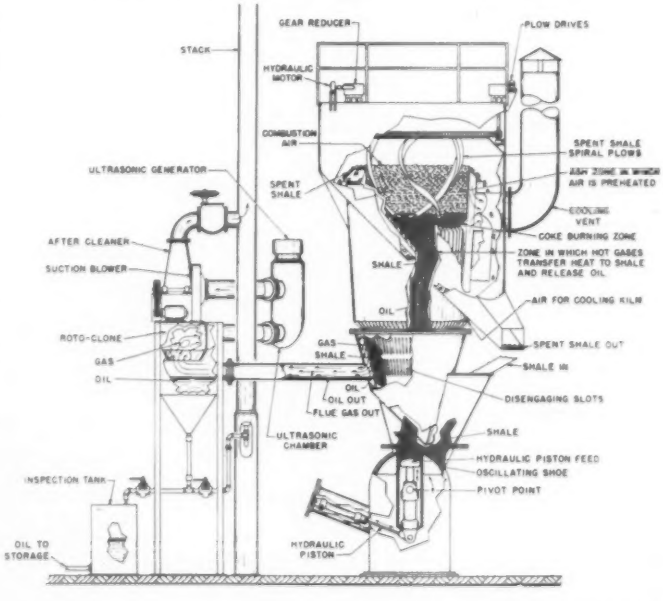
RETORTING PLANT PERFORMANCE

Shale feed, tons/c.d.	20,000
Shale oil products, bbl./c.d. (20.7° A.P.I.)	13,125
Gas production (dry, total), M.s.c.f./c.d.	270,000
Shale ash, tons c.d.	12,500
Air rate to kilns, M.s.c.f./c.d.	203,000

Shale-oil reserves . . . W. F. Stone, general engineer, U. S. Bureau of Mines, Shale Oil Demonstration Branch, Rifle, Colo., told the engineers there is an enormous potential source of hydrocarbon products in the oil-shale beds of Colorado, Utah, and Wyoming.

The best oil shale for industrial utilization is in northwestern Colorado, he said. In that general area, 1,000 sq. miles of oil shale is regarded as being of commercial importance in the near future. For economic reasons, only the series of beds known as the Mahogany ledge, which ranges up to 110 ft. in thickness and averages 25 to 30 gal. crude oil per ton, will be mined at

Schematic Diagram of Union's Shale Retort



first. However, there is a measure about 500 ft. thick, including the Mahogany ledge, that averages 15 gal. per ton.

It is estimated that at least 80 billion barrels of crude shale oil can be recovered from the Mahogany ledge alone and that 400 billion barrels can be recovered from the 500-ft.-thick measure, Stone said. That is nine times as much oil as has been produced altogether in this country since the first petroleum well was drilled in 1859.

Pipe-Line Control

New way to obtain smoother line operation and a cheaper and more accurate means of controlling flow described

KANSAS CITY.—Flow through pipe lines can be controlled and supervised conveniently and reliably over any reasonable distance by means of electric valve operators.

Electrical operation of valves permits batching of several products and at the same time permits the operator to cut a stream at any desired point in the interface between products, H. A. Altorfer told the Petroleum Division of the American Society of Mechanical Engineers here last week.

Altorfer, of Rockwell Manufacturing Co., Oakland, said the mechanization of valve control reduces the required labor force and, consequently, the chances for operating error. Flexible operation of pumping stations, with exact timing during starting and stopping cycles, is inherent.

Electric control procedure . . . The electric valve operator is well suited for remote control, including microwave transmission, Altorfer said. The control is supervised and initiated from a control board containing a line diagram of the valve installation, with push buttons for starting and stopping and lights which show whether a valve is open or closed.

An electric valve operator consists fundamentally of a gear drive, with electric motor and auxiliary devices. The operator is generally used with plug valves which must automatically stop after having made a 90° turn of the plug. Limit switches are geared into the operator mechanism to interrupt the electrical control circuit as soon as the 90° turn has been made.

These limit switches can also be used for other purposes, such as operating indicating lights to show open and closed valve positions, and for any number of other auxiliary circuits. Electric valve operators may also be used with the continuous valve position indicator, including remote indication equipment through selsyn devices or through a potentiometer circuit.

Electric motor operation . . . Standard electric motors are unsuitable for valve operator drive; their starting torque is too low to be practical. The motor must start the entire gear train including the valve from the starting condition under correspondingly high coefficients of friction.

A reversing contactor enables the motor to run in either direction for opening and closing the valve. The controls are interlocked so that it is not possible to call for both directions of rotation at the same time. At complete close or open position, the valve can turn only in the opposite direction, but as soon as the reverse motion has started, the limit switches are automatically reset to enable immediate reversal.

Any initiated motion will continue after a button is pushed until the limit of valve travel is reached, or until another button is pressed.

Emergency operation . . . In case of power failure the operator may be actuated manually by means of a handwheel. The handwheel does not turn when the electric motor is in operation; neither does the handwheel have to drag the electric motor through the operator unit gearing when manual operation is employed. The electric operators are equipped with automatic or manual declutching devices to provide this feature.

Pipe-Line Control

A new method of controlling two related variables, such as pump suction and discharge pressure, was detailed by Harold R. Hoyt, Great Lakes Pipe Line Co., Kansas City, in his paper, "Instrument Application in the Product Pipe-Line Industry." The method utilizes standard pneumatic-type hydraulic governor control equipment, with minor modifications.

Ever since the hydraulic governor for internal-combustion engines was introduced into the pipe-line industry to provide synchronized pumping rates among all pumping units on the line, there have remained some problems.

In employing the hydraulic governor, the general method was to utilize the suction or incoming pressure to a pumping unit to vary the governor setting so that an increase in flow rate, and consequently in incoming pressure, raised the governor setting. This speeded up the pumping unit, tending to maintain a constant incoming pressure. A drop in suction pressure would lower the governor setting and slow the unit down.

However, if the suction pressure suddenly dropped, the usual suction controller could initiate no correction until the pen had dropped below the control point. Similar difficulty could exist if the suction pressure were the controlling variable and the discharge pressure suddenly took over the control.

The improved controller eliminates these problems entirely, and is simplier and less expensive. The pneumatic control unit has a nozzle and baffle assembly which can be positioned by either the suction pressure pen or the discharge pressure pen.

Wastes Become Assets

Acid sludges and waste ammonia, which once posed knotty disposal problems, now produce valuable petrochemical

KANSAS CITY.—Refinery acid sludge and waste ammonia, materials which formerly represented only waste-disposal problems to the refiner, now can be utilized in the production of ammonium sulfate.

This development was revealed here last week by E. D. Fox, of The Fluor Corp., Los Angeles, in a paper presented before the A.S.M.E.'s seventh annual Petroleum-Mechanical Engineering national meeting.

The process constitutes one satisfactory answer to pollution of stream atmosphere. Statutory regulations in this field are becoming increasingly stringent.

How it works . . . The process for manufacturing ammonium sulfate from waste acid sludge and ammonia varies only slightly from the conventional process using relatively pure sulfuric acid and ammonia. Essentially, it involves introducing ammonia into sulfuric acid to form ammonium sulfate. The ammonium sulfate then is separated by evaporative crystallization and filtration and dried.

The available free sulfuric acid in

acid sludge will react with ammonia as readily as pure sulfuric acid. Therefore acid sludge may be used directly in the process without first separating the acid phase from the oil phase.

Ammonia required for the reaction may be either pure tank-car ammonia or waste ammonia stripped from various refinery streams.

Flow plan . . . Acid sludges from various refining processes are collected in a common storage tank equipped with agitation facilities to insure a uniform feed to the process.

The combined acid sludge and stripping steam containing the required ammonia are introduced near the bottom of the reactor and flow upward through recycled ammonium sulfate mother liquor and oil from the sludge. The ammonia in the stripping steam reacts with the acid in the sludge to form ammonium sulfate which, together with the sludge oil and recycle mother liquor, rises to the top of the reactor where it overflows to an oil separator.

Steam and fixed gases pass overhead to a condenser where the steam is condensed out and separated from the fixed gases. These noncondensables are either flared or sent to other processing units, depending on the constituents therein.

Heat of reaction utilized . . . The sulfate-forming reaction is highly exothermic. In order to utilize fully the heat of reaction released in the reactor for the subsequent evaporation and crystallization processes, cold mother liquor in sufficient quantity to absorb all the reaction heat is continuously recycled to the reactor. The sole function of this recycle is to act as a heat carrier; therefore, the recycle rate is fixed by the available heat of reaction.

Acid-sludge and ammonia-feed streams to the reactor are proportioned to maintain a sulfuric acid concentration of about 0.5 per cent in the ammonium sulfate liquor leaving the reactor. This concentration assures relatively complete utilization of the available ammonia, and promotes large crystal formation in the subsequent crystallization step.

The reactor is operated at about 7 psig. so that the ammonium sulfate liquor will flow from the reactor, through the separator, and into the crystallizer without intermediate pumping. At this pressure, the temperature of the nearly saturated ammonium sulfate solution is about 243° F. Operation at higher pressures and correspondingly higher temperatures is not avisable, since ammonium sulfate corrosion is greatly accelerated by increased temperature.

Improved fireproofing . . . An improved method for fireproofing structures was described by C. J. Kuhasz, development engineer, M. W. Kellogg Co., New York. It reduces the installed cost of protection of structures by encasing the main structural members in a fire-resistant material.

The method takes advantage of using field-fabricated sections of lightweight concrete (Perlite aggregates, used with Ia air-entrained Portland cement in ratio 4 or 5 to 1). The sections are easily handled, due to a decrease in weight of 60 per cent when compared with most presently used materials, and at the same time they afford better fire resistance.

Over-all advantages of the new fireproofing include: (1) Savings in critical materials required, (2) reduction of dead loads on the structures and their foundations, (3) elimination of work stoppages by other crafts resulting from dripping and rebounding materials, and (4) reduction of cleaning up after installation.

Wildcat Report

August completions were under July, but success rate was better; all major areas had important developments

John C. McCaslin

THE nation's wildcatters didn't set any completion records in August, but they saw important developments in all areas.

The industry completed 946 wildcats during the month, 17 fewer than July and 132 fewer than August 1951. Of the 946 total, 127 found oil, 24 discovered gas, and 795 were dry.

The 946 completions represented 23 per cent of all wells completed during the month. For the first 8 months of 1952, exploratory wells have accounted for 22 per cent of all completions and 24 per cent of all footage drilled.

August's 127 oil discoveries were the same number recorded in July, but the 24 gas wells represented an increase, as did the total footage drilled. Completions and footage by states, together with a comparison between figures for the first 8 months of this year and the same period last year may be found in the accompanying tables.

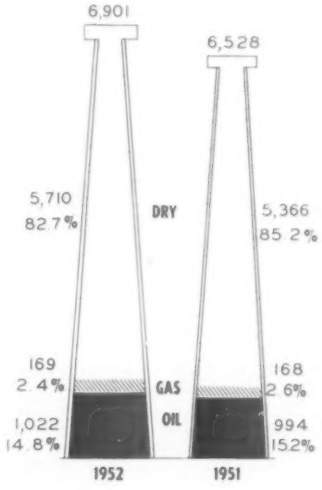
The swing to a higher percentage of wildcats is due to the steel shortage. Programs for the distribution of scarce materials have made it easier for operators to get materials for wildcat drilling than for development projects. The number of wildcats drilled is expected to increase during the remainder of the year, tending to cut development drilling in some areas.

Texas held its usual first place with 367 wildcat completions, down considerably from July. Kansas and Oklahoma were both up substantially over July, reporting 88 and 82 completions, respectively. Only Mississippi reported fewer completions in August than in July.

Permian basin . . . Active rigs in West Texas continued their decline started with the steel strike, but wildcat operations held steady, and interest switched from the rapidly spreading Spraberry fields to deeper exploration in Ector, Upton and especially in northeast Andrews County. Spraberry drilling and extension wells completed held an almost normal pace in Pembrook and North Pembrook fields, on the south end of the long Spraberry trend.

Pennsylvanian wells extended the area north of the Pegasus main field, and Magnolia Petroleum Co. established Ellenburger production between the two pools. On the southwest side of Pegasus, 3 miles from that field's Ellenburger production, Magnolia 1-P TXL established Ellenburger production.

Continental Oil Co. added several extensions to the prolific Elkhorn-Ellenburger field in Crockett County, and Phillips Petroleum Co. brought in a big



Wildcat Exploration . . .

. . . first 8 months

Ellenburger confirmation well in the old Block 12 area of Andrews County.

During August, Phillips reentered an old dry hole northwest of the Magutex Devonian and Ellenburger discovery well, and by end of the month had established good production in the Devonian. Farther northeast, still in Andrews County, The Texas Co. 1-Z State found water in the Ellenburger, but plugged back to make a good well in the Devonian.

Phillips Petroleum Co. completed its Pecos County gas discovery, the 1 Glenna, the the deepest producer in the basin. Completion perforations in the Ellenburger were 13,700-13,835 ft., 14,090-14,285 ft., 14,400-460 ft., and 14,485-522 ft., total depth.

California . . . August wildcatting developments in the Golden State included the discovery of two shallow pools which are undergoing relatively rapid development. At Lost Hills field in Kern County, where Superior Oil Co. found a new 3,000-ft. Pliocene sand, two offsets have found the pay and three other outposts are drilling or were being prepared.

Union Oil Co. is adding a new producer at about 10-day intervals at a new field associated with the Oakridge thrust fault in central Santa Clara Valley. These new wells are being completed in a 400-ft. Miocene sand section at about 3,200 ft., flowing about 300 bbl. daily.

Second wells also were completed at Wheeler Ridge and Torrey Canyon, both of which are expected to develop into major discoveries.

Oklahoma . . . Interest in Oklahoma during August continued to center in the Beaver County Panhandle area.

Carter Oil Co. completed its second confirmation well for the recently opened Greenough pool, the well being good for 180 bbl. of oil in 12 hours. Discovery of the field has already been confirmed at an east offset to the discovery well. Floris pool was opened by Carter south of the county's Greenough pool.

Oklahoma County has a new important basal Pennsylvanian sand producing area just east of Oklahoma City on the east flank of the Oklahoma City field. R. W. Hibbert opened the new producing area in July with completion of a gas-distillate well. Magnolia Petroleum Co. is taking potential test at the confirmation well to this highly regarded discovery area.

Rocky Mountains . . . G. H. Vaughan Production Co. tested oil in the Tensleep in the Dad unit area of Carbon County, Wyoming. The well is the first Tensleep test in the area south of Hatfield and opens a broad area comprising practically all the Green River basin to Tensleep possibilities.

Stanolind Oil & Gas Co. recovered Mesaverde oil in southern Sweetwater County, Wyoming, in the Middle Mountain area. Success of this wildcat is expected to renew leasing in the Washakie basin portion of the Green River basin.

J. Ray McDermott & Co. completed a new Ash Creek Shannon producer in the previously nonproductive general north portion of the Powder River basin. This Shannon discovery is regarded as one of the outstanding discoveries of 1952, due to the distance from previously established production.

The Texas Co.'s confirmation well in the northwest Sumatra area of Montana showed for a gage more than twice that of the pool opener on early tests. The new producer made 750-1,000 bbl. of oil daily. The apparent new pool is half way between Sumatra and Ragged Point fields in an area where Texas has done considerable exploration. The Texas discovery is the first potentially major development in the state in recent months outside the Williston basin portion of the state.

Kansas . . . Late in August W. J. Coppinger put on pump a rank wildcat discovery well in Finney County after swabbing oil at the rate of 30 bbl. daily. This rank wildcat is the first oil discovery within the confined limits of the Hugoton gas field area.

Mississippi — Southeast . . . Adams County, Mississippi, chalked up two more Wilcox oil discoveries during the month, opening Jeanette field and Locust Hill field. Pearl River County recorded two new condensate discoveries.

For a complete summary of all August completions see page 355.

WILDCATS—FIRST 8 MONTHS

	1952		1951	
	Total completions	Cumulative footage (1,000 ft.)	Total completions	Cumulative footage (1,000 ft.)
Kansas	586	2,287	653	2,325
Oklahoma	508	2,364	547	2,234
Texas	3,242	15,544	2,884	13,745
North Central	1,419	4,784	1,220	4,064
West	580	3,398	560	3,565
Panhandle	44	290	18	112
East	178	979	177	759
Gulf Coast	467	3,547	441	3,057
Southwest	554	2,546	468	2,188
Louisiana	256	2,268	231	1,827
North	112	657	122	648
South	144	1,611	109	1,179
Mississippi	211	925	94	667
Rocky Mountain	299	1,586	183	871
Dakotas	24	160	3	18
New Mexico	102	679	57	313
California	383	1,743	346	1,452
Others	1,290	3,516	1,530	3,840
Total	6,901	31,072	6,528	27,292

WILDCAT COMPLETIONS—AUGUST

	Total	Oil	Gas	Dry	Footage
Kansas	88	12	1	75	359,894
Oklahoma	82	10	2	70	349,996
Texas	367	68	11	288	1,796,793
North Central	157	42	0	115	558,765
West	66	13	1	52	429,456
Panhandle	8	0	1	7	50,849
East	25	1	0	24	115,027
Gulf Coast	56	9	4	43	405,120
Southwest	55	3	5	47	237,576
Louisiana	51	7	3	41	440,418
North	25	3	1	21	147,986
South	26	4	2	20	292,432
Mississippi	19	3	0	16	136,557
Rocky Mountains	56	4	1	51	254,230
Dakotas	10	0	0	10	58,244
New Mexico	14	4	0	10	99,859
California	49	9	1	39	195,231
Others	210	10	5	195	550,713
Total August 1952	946	*127	24	795	4,241,935
Total July 1952	963	127	19	817	4,198,820
Total August 1951	1,078	167	25	886	4,555,636
Cumulative 1952	6,901	1,022	169	5,710	31,071,762
Cumulative 1951	6,528	994	168	5,366	27,291,635

*Incl. 8 condensate wells: Texas Gulf Coast 2, S. La. 4, North Central Texas 1, East Texas 1.

THIS CABLE-TOOL RIG is drilling Michigan's most unusual wildcat, a well which is setting records in tenacity and perseverance.

DRILLER ON THE WELL is William R. Albers, left, shown here talking to Jack Greer, a Carter Oil Co. land man who dropped by to discuss the well's progress.

Drilling in Granite

Jacob Beck, firmly convinced he will discover oil where geologists say it can't be, still drilling after 12 years

Ted Armstrong

MONROE, Mich.—One of the world's most unusual wells was temporarily stymied last week by a fishing job.

The Jacob Beck 1 Sancrant is unusual because it is looking for oil in the Canadian Shield, sometimes referred to as the backbone of North America; it is now in its thirteenth year of off-and-on drilling; and it has drilled 1,868 ft. into solid granite.

Last week the cable-tool rig was fishing for telescoped 5-in. pipe, and the driller estimated it might take another week before drilling would be resumed.

Beck clings firmly to his belief that the wildcat will find oil, in spite of the universal opinion among geologists that oil production from granite is an impossibility.

History . . . The well is located in Section 19-7s-7e, in Monroe County, Michigan. It was spudded in June 1940. The operator topped the granite wash at 3,595 ft., hit solid red granite in 1942 at 3,627 ft., and is now at a total depth of 5,495 ft. From 3,727 ft. on down the well has been in solid, tombstone-gray granite streaked with black.

Operations were suspended in 1950 at 5,470 ft., and work was resumed only recently, with drilling going ahead under a contract which calls for a rate of $50 a foot.

William R. Albers, the driller, says he makes about an inch an hour—or a foot in a 12-hour day. To date, the granite-drilling operation has consumed 47 feet of bit steel. The tools must be dressed after every 3 or 4 in. of hole. Drilling is carried on only during daylight—and during good weather.

OVERSHOT is readied by Albers as the veteran driller prepares to continue fishing in an effort to recover telescoped pipe.

Until recently the rig was equipped with an automatic device which permitted continuation of drilling after normal working hours. At the end of the working day, the bit would be dressed, the clamps would be moved up the line, and the driller would leave.

A few hours later, after the rig had 2 or 3 in. of "extra" hole, the automatic arrangement would shut off the power.

The well already has surprised geologists once. When it reached a depth of 3,874 ft., or 247 ft. into solid granite, it hit a flow of highly corrosive water which ate up several hundred feet of sand line and a bailer within a few months. Flow was estimated at 300 ft. per hour. Dr. K. K. Landes, University of Michigan professor, later explained that the water was due to circulation through a crevice from the granite wash.

No record yet . . . Even though the 1 Sancrant is nearly 2,000 ft. into solid granite, it doesn't yet hold the record for basement-rock drilling. There is on record a Canadian wildcat, drilled some years ago, which was abandoned at 3,100 ft. after drilling through 2,375 ft. of granite. The well was located in Mariposa Township in Ontario, about 80 miles northeast of Toronto.

Another wildcat, in Ocean County, New Jersey, claimed a greater penetration of basement rock—3,680 ft.—before being abandoned at 5,022 ft., but most of the drilling was through the Wissahikon Schist, which is metamorphic allied with igneous rock.

New Allowable Record

Texas operators permitted to produce 3,268,813 bbl. daily in October, up 43,398 bbl.; producing days hiked to 23

AUSTIN. — New all-time record-high allowables for crude production in Texas are becoming almost commonplace.

The Texas Railroad Commission has set another one with its order allowing operators in the state to produce an average of 3,268,813 bbl. daily during October. This is up 43,398 bbl. daily over the allowable originally established by the commission for September and 4,344 bbl. higher than the revised allowable for the week ended September 20.

The new allowable was fixed on a 23-producing-day basis for the state generally, with East Texas field allowed 18. Last month producing days were set at 22 and 19.

The cut in East Texas production followed testimony which revealed reservoir pressure in the field had declined 3 psi. during August.

Disagreement . . . There was considerable disagreement at the hearing preceding the setting of the October allowable as to how much crude should be produced.

Don Crites, of Shell Oil Co., urged that the commission cut production sharply from that allowed in September. He said Shell favored a 20/19 arrangement, which would still leave the company with West Texas crude for sale.

The Texas Co. nominated for 21 days but said it could get along nicely on 22.

Opposition to a cut came from a majority of the companies, however. Paul McDermott, representing Sinclair, suggested 23/19. The East Texas situation, he said, is not serious, since reservoir pressure has increased 12 psi. in 4 years in spite of the current decline.

Humble Oil & Refining Co., Magnolia Petroleum Co., and Gulf Oil Corp. favored 22 producing days. Humble and Gulf added, however, that 23 days would suit them fine. J. A. Neath, representing Humble, said his company's stocks were still low.

Sun Oil Co. came out for 23/19. Sun's Joe Owens reported that his company still needs more oil despite record production.

Ralph Dietler of Stanolind Oil & Gas Co. warned against too-heavy production. A 22-day figure should be ample for the state as a whole, he said. As for Stanolind itself, Dietler said 22 days would be more than enough. Commissioner Ernest O. Thompson replied that crude stocks had been decreasing appreciably week after week. Dietler countered by saying that product stocks have been increasing considerably at the same time.

Concern over imports . . . Bryan Payne, president of Texas Independent Producers and Royalty Owners Association, thought the commission ought to increase allowables even further.

His organization, he said, is concerned over the possibility that importers will use any allowables reduction in Texas as full justification for "stepping up imports which are already at peril points."

The independents feel that the importing companies may use the President's recent action in granting them the equivalent of a "10 per cent increase in price on imported oil as an excuse for unloading more foreign crude on the domestic market in the name of free trade," he added.

ALLOWABLES BY DISTRICTS

District—	Bbl. daily
1	41,786
2	176,485
3	522,516
4	288,172
5	54,587
6 Outside East Texas	134,712
East Texas field	252,648
7B	135,692
7C	205,716
8	1,107,065
9	252,318
10	97,116
Total	3,268,813

Storage Rules Approved

AUSTIN.—A reef bioherm lying at a depth of 6,180 ft. will be converted soon to underground natural-gas storage by Lone Star Gas Co.

The Texas Railroad Commission last week adopted storage rules for New York City field in Clay County.

In reclassifying this former oil-producing field for gas storage, the commission required that 200 ft. of surface pipe be used on all wells withdrawing gas, and that this pipe be cemented to the surface and be subjected to 3,000-psi. pump-pressure tests. Minimum working pressure for Christmas-tree fittings was specified at 3,000 psi. No spacing requirements for injection or storage wells was fixed.

The field was discovered April 1, 1949.

Gas will be injected at a maximum rate of 20,000 M.c.f. per day through a group of redrilled facility wells into a closed-reef reservoir covering only 400 acres. When filled to original pressure of 3,000 psig., the reservoir will have a gas-storage capacity of 6 billion cubic feet.

Chadbourne Wells Sold

SAN ANGELO.—T. W. Murray has turned a one-quarter interest in 36 producing wells in Fort Chadbourne field of northwest Runnels County to N. P. Powell, Tyler, Tex., for $1,600,000 according to reports.

The deal included a $1,250,000 cash payment and an assignment to Murray of unidentified properties valued at $350,000. Thirty-four of the wells in the deal are listed on the Texas Railroad Commission proration schedule as having a total daily allowable of 2,688 bbl.

ROCKY MOUNTAIN

New Mesaverde Strike

DENVER.—A natural-gas discovery in the Mesaverde formation was reported last week by Mountain Fuel Supply Co.

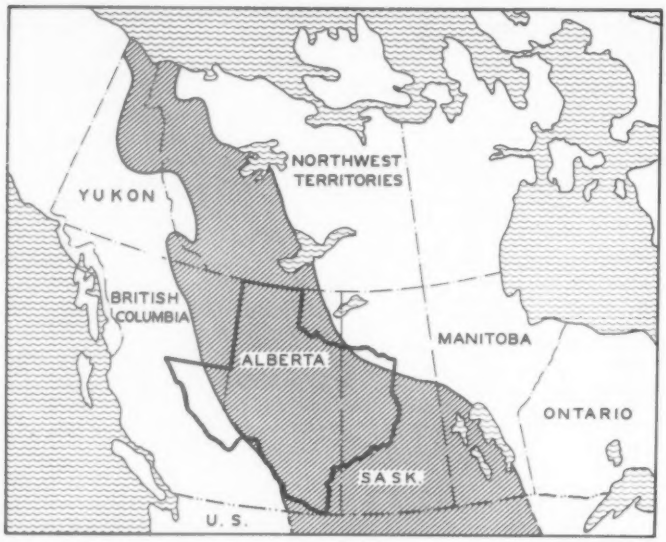
The company's Trail Unit wildcat in southwestern Wyoming flowed 4,260 M.c.f. daily from the basal Blair sand, lower member of the Mesaverde.

The discovery is 20 miles northeast of the Middle Mountain wildcat being drilled by Stanolind Oil & Gas Co. which found oil in the Mesaverde several weeks ago.

Operators will continue testing the Trail wildcat before official completion is made. Stanolind is below 8,000 ft. at the Middle Mountain oil discovery.

Continental Oil Co. has recovered oil from the Mesaverde in the Uinta basin along the southern side of the Tertiary area at Chapita Wells in Utah. The company is preparing to core ahead after recovering 700 ft. of 60°-gravity oil on a drill-stem test from 8,282-96 ft.

Successful completion of the Utah Mesaverde discovery and the discoveries in the southern Green River basin of Wyoming will undoubtedly lend impetus to an increased exploratory drilling program in both basins.



SHADED AREA of western Canada outlines vast sedimentary area. For comparison, a scaled outline of Texas is superimposed on Alberta.

New Look at Canada

Texas-type optimism colors its successes, but it still is a big area with a lot of activity—and big prospects

Henry D. Ralph

CALGARY, Alta.—Canadian oil is suffering from an overdose of optimism which makes it difficult for American oil men to evaluate the glowing reports which pour south of the border.

Actually, Canadian oil development is far from as static as some Americans consider it, but neither is it as far advanced or moving as rapidly as Canadians like to think it is.

As a matter of cold statistics, all of western Canada has proven reserves about equal to those of Oklahoma, and its total production currently is about the same as the output of Illinois or New Mexico.

But it is by no means a drilled-up area of settled production. Its capacity to produce crude oil is almost twice the volume that transportation and market outlets can absorb at the moment. And exploratory work is at a high level over a wide region, with enough successes to give color to Canadians' predictions that the area will be one of the world's major oil regions within a few years.

On the other hand, Americans are well advised to discount many of the initial reports of big discoveries which appear in the local press. Allowance should be made for the local optimism and the prevailing psychology, and judgment reserved until complete data can be analyzed.

Canada's "Texas" . . . Alberta calls itself "The Texas of Canada," and with some justification. The province has oil, wheat, cattle, and lots of wide open spaces. And the Albertans are optimistic, free-talking, and disinclined to use understatements when describing the size, resources, and future of their area.

Alberta is nearly as big as Texas—255,283 sq. miles against 267,359—and its north-south expanse is almost exactly the same as the distance from Brownsville to the Oklahoma Panhandle. And like Texas most of its area is sedimentary in origin, favorable to the accumulation of oil and gas.

But Alberta lacks Texas' 50 years of experience in oil development. It still has the boom psychology of the frontier and the promoter, plus a background of the gold rush and the more recent mining bonanzas.

Boom psychology . . . As a consequence the unofficial reports and statistics make it appear that western Canada is bringing in a big new oil or gas strike every week or so.

Almost any well with a show of oil or gas may be called a "discovery" in the first announcement, even though it may be a short step-out on a proven structure. Not infrequently a well hailed as a discovery on the drill-stem test proves to be noncommercial and later shows up in the official statistics as plugged and abandoned.

One reason for this condition is the brisk speculative market in securities of new and small companies, reminiscent of the oil-stock fever in Texas and the Mid-Continent a generation ago. It is not beyond some "blue-sky" promoters to ballyhoo a noncommercial well as a "discovery" for the purpose of unloading a few thousand shares of low-priced stock.

The tendency to avoid understatement is aided and abetted by the boom atmosphere which colors much of Albertans' thinking. Newspapers and radio announcers and even oil-reporting services fall into the same habit. Apparently they accept without question all claims of big oil strikes and sometimes add their own rosy interpretations to the factual announcements of the more conservative operators.

This situation is deplored by the larger and more established companies, particularly those staffed with men trained in the United States where a discovery is defined as a well which finds commercial quantities of oil or gas in a reservoir not previously known.

No big strikes . . . The fact is that except for Golden Spike, discovered in 1949, Canada has not proved up a single major oil field since Leduc and Redwater in 1947 and 1948. All three of these are Devonian reefs close to Edmonton near the geographic center of Alberta.

All the other reported discoveries of the past 5 years of feverish wildcatting over a tremendous region have not yet proved up a major oil field by United States standards—a field with proven reserves of at least 100,000,000 bbl.

It is true that several recent strikes give indications of turning into major fields, but only months of development drilling and reservoir analysis will give the answer.

But the many bonafide discoveries of lesser pools add up to a respectable total of reserves and producing capacity.

"Alberta's smaller pools may not be spectacular but they might be com-

pared in importance with Kansas," one transplanted American oil man observes. "Kansas has only four major fields but its scores of small pools account for 80 per cent of the state's steady production of more than 300,000 bbl. per day."

Another expatriate—from Texas—thinks this comparison is too modest. "We don't think we're in any Kansas," he says emphatically. "We're looking for another East Texas field and we expect to find it."

Big favorable areas . . . There is plenty of room for several East Texas fields in the sedimentary bed of the western Canada basin, which extends for 700,000 sq. miles across almost all of Alberta, two-thirds of Saskatchewan, corners of Manitoba and British Columbia, and on through Northwest Territories to the Arctic Ocean and Alaska.

It is 1,600 miles from the southeasternmost production in Manitoba to Norman Wells field in Northwest Territories, and the sedimentary belt is from 200 to 700 miles wide.

Since considerable oil has been found in scattered places throughout this vast range, it is a reasonable assumption that a lot more remains to be found, and this makes western Canada a prime exploration and wildcatting region.

The bulk of the favorable and accessible area from the United States border far up into Northwest Territories has been covered by reservations (exploration permits) on government lands. The holders have only 3 years to prove up these reservations and apply for producing leases on half of each tract. Moreover, the rent mounts up rapidly on a sliding scale unless an equivalent amount of money is spent in exploratory work.

So exploration is at a high pitch. More than a billion dollars has been poured into western Canada oil during the last 5 years, and it is estimated that $250,000,000 is being spent in exploration and development work this year. At midyear there were 175 geophysical parties in the field, 157 of them making seismic surveys. There are approximately 250 drilling rigs active throughout the region, more than 100 of them on wildcats.

"We've just scratched the surface of our potential oil territory," says one enthusiast. "When you consider that we have three times as much sedimentary areas as Texas, and the wide stretches of untested territory, no one should be disappointed because we don't find another Redwater every week."

Reserves and production . . . While there have been no new Redwaters, the cumulative effect of the many smaller finds adds up to a respectable total. The Western Canada Petroleum Association estimates that as of June 1952 the proven reserves of western Canada were 1,540,340,000 bbl., of which Alberta had 1,487,196,000 bbl. These estimates are on the same basis as the American Petroleum Institute uses in calculating United States proven reserves, and can be considered conservative.

These figures show that during the first half of this year the reserves of all western Canada increased 263,740,000 bbl., and Alberta's increased 159,191,000 bbl. This amply verifies the Canadians' rule-of-thumb formula that their reserves will continue to increase by around 300,000,000 bbl. annually. An increase of reserves of this magnitude probably would support an annual increase in production of more than 50,000 bbl. per day.

The present producing capacity of western Canada may be close to 300,000 bbl. per day. At the end of 1951 Imperial Oil, Ltd., estimated the production potential at 205,000 bbl. per day, but the Alberta Petroleum and Natural Gas Conservation Board figures that Alberta alone could have produced 245,000 bbl. per day during December 1951 if market outlets had been available. Albertans say they could now produce around 280,000 bbl. per day. Actual production in Alberta during the first 6 months of this year averaged 136,600 bbl. per day.

A small part of this was low-gravity crude, of a grade often snubbed in the United States. But this heavy crude finds a ready market in prairie province refineries, and even though the price is lower the shallow black-oil fields, by and large, often have a better payout than the deeper, heavily prorated wells producing high-gravity crude. This is because of the big demand for heavy fuel oil from industries and railroads, since railroad dieselization has progressed very slowly in Canada, and also because of the tremendous need for asphalt for surfacing the largely unpaved highways of the prairie provinces.

Markets growing . . . The prospect for new markets is a powerful lever under Canadian optimism. Per capita consumption of petroleum products in the prairie provinces is increasing rapidly with the mechanization of agriculture and the influx of industry, and the refining capacity of the region is growing apace.

The Interprovincial pipe line, which took an average of 38,400 bbl. daily of Alberta crude to the head of the Great Lakes during 1951, is being expanded to an ultimate summer capacity of 120,000 bbl. per day. The line's actual throughput is expected to average about 88,000 bbl. per day during 1953.

The Trans Mountain line, which will not be subject to seasonal variation because it goes to the all-weather port of Vancouver, should be completed and start filling next fall and is expected to carry between 75,000 and 120,000 bbl. per day initially out of the Edmonton area. There appears to be adequate reserve producing capacity within economic reach of gathering lines to support such movement.

Furthermore, every bona fide discovery, even though it proves up only a small reserve, buoys up the wildcatters' spirits. And there have been enough of these recently to keep enthusiasm high.

It's as hard to find a pessimist in Calgary as to find a Texan who underrates his state.

Moose Jaw Plant Opened

TORONTO.—British American Oil Co., Ltd., last week officially opened its expanded and modernized refinery at Moose Jaw, Sask.

The revamped refinery incorporates Saskatchewan's first catalytic cracking unit. It will run about 15,000 bbl. daily.

Principal speaker at the ceremony was Premier T. C. Douglas of Saskatchewan.

Construction work was completed in approximately 22 months. Labor and all materials possible were obtained in the Moose Jaw area.

The original Moose Jaw plant was erected in 1933, and the expansion was launched in July 1950.

Exploration at Peak

CALGARY. — Geophysical exploration in western Canada reached a new all-time high in August with a total of 183 parties active in the field.

This total surpasses July's record by 8. Of the 183 parties, 164 are seismograph crews, 15 are gravity meter, and 4 are magnetometer. The number of seismograph crews and magnetometer crews both increased over July.

Alberta led the provinces with a total of 127 crews in operation, up 5 over July, including 118 seismograph crews, and 9 gravity meter. Saskatchewan reported 39 seismograph crews, 5 gravity meters, and 2 magnetometers for a total of 46, up 5 over July. There were five active parties in British Columbia, four seismograph crews and one magnetometer. Manitoba had four crews in the field, three seismographs and one gravity meter. The Northwest Territories had one airborne magnetometer crew in operation.

Six major companies are operating 87 of the crews, headed by Imperial Oil, Ltd., with 23. About 24 other companies are operating the remaining 96.

Steel Cut 25 Per Cent

Oil industry to get full quota of tubular goods in first quarter, but its share for all other uses is pared sharply

WASHINGTON.—Carbon-steel allocations for oil and gas transmission in the first quarter next year will be cut one-third under the allotment for the current quarter as a result of last spring's steel strike.

There will be 115,181 tons less steel available for oil transportation and 101,878 tons less for gas transmission and distribution.

With the exception of the oil-country tubular-goods quota, which remains unchanged, cuts will be made in carbon-steel allocations for all other purposes to bring the industry's use of steel down by 25 per cent to conform to the over-all reduction ordered by the Defense Production Administration.

The cuts will amount to 35,000 tons for oil-field machinery and equipment, 32,212 tons for oil and gas production, 30,986 tons for refining, 8,920 tons for marketing, and 5,773 tons for natural-gas production and processing.

First quarter . . . DPA steel allocations for the first quarter of next year were but 75 per cent of those for the quarter now ending. They gave the Petroleum Administration for Defense 1,428,250 tons of carbon steel, compared with 1,763,000 tons; 127,894 tons of alloy steel, against 140,000 tons; and 600 tons of stainless steel, against 750 tons.

Because of the strike, no steel allocations were made for the final quarter of this year, but tickets for third-quarter steel were made valid for delivery through the fourth quarter.

There was no interruption in the supply of copper and aluminum, and allocations were made for the fourth quarter as usual. The first-quarter allotments of the two metals were the same as for the coming 3 months—8,752,000 lb. of copper and 1,700,000 lb. of aluminum.

PAD's division of the three metals among the various segments of the industry except for stainless steel, which is parceled out as needed, will be as follows:

Natural-gas production and processing will get 35,397 tons of carbon steel against 41,170 tons for the third quarter; alloy steel, 183 tons against 244 tons; copper, 470,000 lb.; aluminum, 56,000 lb.

Gas transmission and distribution: Carbon steel, 305,334 tons against 407,212 tons; alloy steel, 2,700 tons against 3,600 tons; copper, 679,000 lb.; aluminum, 78,000 lb.

Oil transportation, including military storage: Carbon steel, 327,486 tons against 442,667 tons; alloy steel, 42 tons against 55 tons; copper, 363,000 lb.; aluminum, 85,000 lb.

Refining: Carbon steel, 142,719 tons against 173,705 tons; alloy steel, 5,437 tons against 7,250 tons; copper, 4,078,000 lb.; aluminum, 478,000 lb.

Marketing: Carbon steel, 9,677 tons against 18,597 tons; copper, 48,000 lb.; aluminum, 3,000 lb.

Oil and gas production: Carbon steel, 501,437 tons against 533,649 tons (both figures including 424,000 tons of oil-country tubular goods); alloy steel, 63,725 tons against 63,775 tons (both figures including 63,575 tons of oil-country tubular goods); copper, 310,000 lb.; aluminum, 195,000 lb.

Oil-field machinery and equipment: carbon steel, 105,000 tons against 140,000 tons; alloy steel, 55,000 tons against 65,000 tons; copper, 2,525,000 lb.; aluminum, 780,000 lb.

A reserve has been set up by PAD of 1,200 tons of carbon steel, against none for the third quarter, and 807 tons

In Charge at A.A.O.D.C. Meeting

THESE OFFICERS will be in charge of activities as the American Association of Oilwell Drilling Contractors opens its annual meeting September 29 in Oklahoma City. Just completing their 1-year term are, left to right, front row: Earle C. Flesher, Johnson & Flesher, Oklahoma City, vice president for the central Mid-Continent; J. V. Dunbar, Dunbar Drilling Co., Salem, Ill., vice president at large; A. W. Thompson, Thompson, Thompson-Carr, Inc., Houston, president; Brad Mills, A.A.O.D.C., Dallas, executive vice president; Marion S. Church, Dallas, general counsel; and Louis A. Beecherl, McDaniel & Beecherl, Dallas, treasurer. Standing are A. H. Bell, Bell & Burden, Inc., Los Angeles, vice president for California; Harry H. Hillman, California Production Service, Long Beach, vice president for well servicing; E. K. Carey, E. K. Carey Drilling Co., Denver, vice president for Rocky Mountains; J. U. Teague, Columbia Drilling Co., Houston, vice president for Gulf Coast; N. H. Wheless, Jr., Wheless Drilling Co., Shreveport, vice president for Cretaceous and Tertiary basins; Harold M. McClure, Jr., McClure Drilling Co., Alma, Mich., vice president for cable tools; R. S. Makin, Makin Drilling Co., Hobbs, N. M., vice president for West Texas and New Mexico; and J. Doyle Settle, A.A.O.D.C., Dallas, secretary. Not shown is Thomas S. Doran, Vandalia, Ill., vice president for Illinois, Michigan, Indiana, and Kentucky.

of alloy steel against 76 tons; 279,000 lb. of copper and 25,000 lb. of aluminum.

Drill pipe . . . A total of 16,505 tons of drill pipe already has been allotted to 402 oil and gas operators and drilling contractors for the first quarter.

Eighty-seven applications for pipe were denied either because the applicant had adequate inventory, or had been granted emergency assistance during the current quarter, or because the application was received after the deadline.

Of the total tonnage allotted, 12,192 tons went to 357 "A" operators having fewer than 10 drilling rigs, and 4,313 tons went to 45 "B" operators with 10 or more rigs.

Most of the allotments were for less than 100 tons; only 4 "A" and 23 "B" operators got 100 tons or more.

The largest allocations were 300 tons, to Humble Oil & Refining Co., Houston, and Loffland Brothers Co., Tulsa.

Products Exports Up Sharply

WASHINGTON.—Exports of major oil products jumped to an average of 249,000 bbl. daily during the week ended August 29 from a revised average of 152,000 bbl. during the preceding week, according to Petroleum Administration for Defense calculations.

With the exception of aviation gasoline, exports of all products showed sharp increases, the greatest gains being in distillate and kerosine.

Details of the week's export movement, compared with the preceding week, and average daily exports for the 4 weeks ended August 29, are shown in the accompanying table in thousands of barrels.

	Week ended— Aug. 29	Aug. 22	Average 4 weeks
Aviation gasoline	15.6	20.7	30.0
Motor gasoline	37.9	19.1	18.3
Kerosine	20.4	3.8	17.9
Distillate	124.4	66.5	78.2
Residual	50.7	41.9	47.8
Total	249.0	152.0	192.2

Tubular-Goods Output Rising

JACKSON'S MILL, W. Va.—Steel-industry capacity for the production of oil-country tubular goods is expected to increase 75,000 tons a quarter by the end of next year, from 465,000 tons during the coming quarter to 540,000 tons in the final quarter of 1953, Deputy Petroleum Administrator J. Ed Warren told the West Virginia Oil and Gas Association, September 26.

Warren said the increase will be

WATCHING WASHINGTON

Bertram F. Linz

CMP End in Sight

The Defense Production Administration is hopeful of terminating the Controlled Materials Plan sometime around mid-1953, but that won't mean the early decontrol of oil-country tubular goods.

Petroleum Administration for Defense officials are as eager as anyone to have controls lifted but they aren't holding out any hopes of a return to a free market in tubular goods for some time to come. The problem, they say, is not that of steel for pipe but of facilities for fabricating it, and it will be a long time before fabricating capacity increases sufficiently to fill the needs of the oil and gas industry.

The tubular-goods situation has been difficult for several years. PAD found it necessary to put pipe under allocation April 1, 1951, 3 months before the CMP went into effect. In comparison with the steadily increasing demand, there has been no improvement in supply, and PAD is now working on plans to have European mills produce more pipe for the overseas operations of American companies so as to relieve some of the strain on domestic supplies.

A measure of the extent to which pipe production must increase before controls can be lifted was given recently when PAD received applications for 400,000 tons of high-priced conversion pipe when it had only 33,000 tons to distribute. With a drilling program calling for an increase each year in the number of wells drilled, demand will continue on the upgrade almost indefinitely.

It's one thing to talk about lifting controls on steel for automobiles, refrigerators, and other consumer goods, where the economy of the nation will not be seriously endangered if somebody has to go short. It's something else when a commodity in as great demand as oil-country goods is involved, and somebody must see that there is equitable distribution until supply and demand are in approximate balance, so that supplies of vital oil products may be assured.

The retention of allocations until the pressure is eased will be especially beneficial to the small operators. Even though they may not like controls any more than anyone else, they are assured of getting material to work with as long as the controls are in effect.

Less Steel Ahead

The oil and gas industry will get only 75 per cent as much steel for first-quarter 1953 operations as it received for the third quarter of 1952.

But Petroleum Administration for Defense officials are well pleased with the allocation of 1,556,744 tons given them by the Defense Production Administration, even though it is considerably less than they had for the current quarter, because many industries received only 60 per cent of their third quarter allotments.

The direct result of the recent steel strike, the cut-back in allocations, will be felt less in production than in other branches of the industry. The allocation of tubular goods will be the same as for the third quarter, because the industry is practically the only customer of the tubular-goods mills, and the impact will be felt mainly in the construction of new facilities.

DPA officials explain that while first-quarter steel production is expected to reach a record high of 22,000,000 tons there will be a substantial carry-over of undelivered fourth-quarter CMP orders and only 17,669,000 tons will be available for distribution.

Rubber-Plant Plan

The Reconstruction Finance Corp. has begun studies for a plan for disposal of the government's synthetic-rubber facilities.

The first step will be an engineering appraisal of the present value of the 26 plants owned by the RFC, consisting primarily of a number of copolymerization plants, butadiene production facilities, a styrene plant and several related facilities.

Under the last extension of the Rubber Act, the President was required to submit a plan for disposing of the synthetic rubber industry to Congress next spring. That does not mean the Government will get out of the rubber business. The same procedure has been followed before only to have Congress decide against sale of the plants.

spread over the year, with 7,500 tons in the first quarter, 15,000 tons in the second quarter, 37,500 tons in the third quarter and 15,000 tons in the fourth quarter.

Warren said, too, that the Petroleum Administration for Defense, working through the Mutual Security Agency, is attempting to bring about a substantial increase in the 1953 output of casing and tubing from foreign mills.

If the increase in domestic production comes through, if the output of conversion pipe holds up, and if the foreign mills produce more, he said, there should be enough oil-county tubular goods in 1953 to reach the programmed expansion goals.

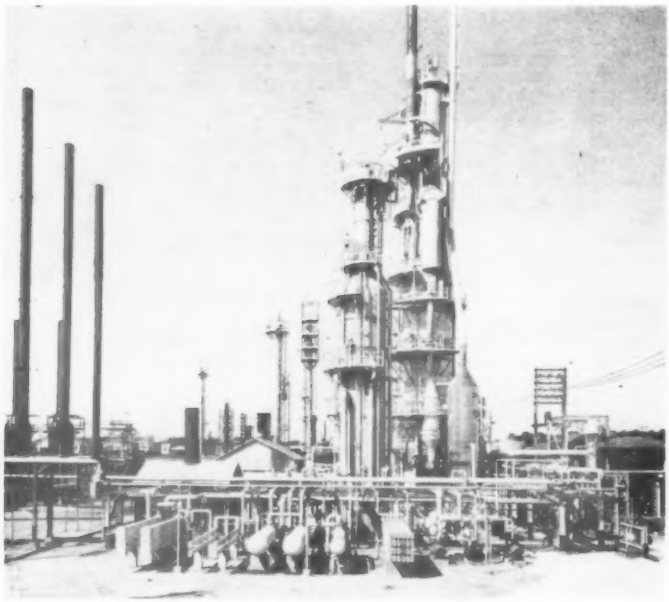
Surface Forces Studied

WASHINGTON.—Fundamental research on the nature of surface forces in oil reservoirs by the Bureau of Mines has been brought nearer the point where it will yield information which the industry can apply to increase recovery and aid utilization.

In a report on his area of the bureau's work, R. A. Cattell, chief of the petroleum and natural-gas branch, explained that the determined presence of minute quantities of vanadium, iron, copper, nickel, titanium, zinc, calcium, and magnesium affects surface tension and film-forming characteristics of the crude oil and may be an important factor in determining the amount of oil that can be produced.

The bureau also is engaged in a special study of shooting oil and gas wells with explosives. An experimental program has been initiated to learn the effect of various methods of well shooting upon reservoir rocks. It involves such factors as types of explosives and methods of loading, including the weight of charges and the amount of stemming that are advisable under various conditions. The program calls for experimental shooting in the field and subsequent laboratory studies.

At the request of the Petroleum Administration for Defense, the bureau is making a petroleum-engineering study of Scurry reef field, where field tests have shown that reservoir conditions are favorable for injection of gas or water to maintain pressure.



One of the Newest Cat Crackers

One of the latest cat crackers to be installed by the refining industry is this 4,600-bbl. per day unit recently put on stream by Kanotex Refining Co. at Arkansas City, Kans. This new cat is representative of the many such units now operating in the United States. Catalytic cracking capacity is at present well in excess of 2,000,000 bbl. per day, or about 50 per cent of total cracking capacity in this country. Greater yield of higher octane gasoline has been the primary reason for the trend to catalytic cracking.

Product Report

Regular report slated on secondary-storage volume

WASHINGTON. — Major petroleum products in secondary storage amounted to at least 52,000,000 bbl. on August 1, according to preliminary figures compiled by the Census Bureau. More than 40 per cent was held in District 1.

Initiating a new series of monthly reports, the bureau estimated that secondary-storage capacity, exclusive of District 5, amounted to 84,500,000 bbl. and that secondary inventories in the four districts for which capacity was figured filled approximately 56 per cent.

The bureau's reports on inventories of petroleum jobbers and secondary supplies of refiners will be figured on a custody basis and will not include the storage capacity of bulk terminals

U. S. SECONDARY STOCKS AND CAPACITY

(Thousands of barrels)

	Secondary stocks	Secondary storage capacity
District 1—		
Gasoline	5,993	9,881
Kerosine	3,262	5,053
Distillate	9,058	14,434
Residual	4,164	6,305
Total	22,477	35,673
District 2—		
Gasoline	8,346	17,254
Kerosine	3,083	6,119
Distillate	5,299	11,459
Residual	1,511	2,248
Total	18,239	37,080
District 3—		
Gasoline	3,299	5,258
Kerosine	641	1,306
Distillate	1,219	2,211
Residual	480	691
Total	5,639	9,466
District 4—		
Gasoline	702	1,382
Kerosine	83	168
Distillate	336	687
Residual	14	22
Total	1,135	2,259
District 5—		
Gasoline	2,329	*
Kerosine	110	*
Distillate	1,130	*
Residual	136	*
Total	3,705	
Total U. S.—		
Gasoline	20,669	
Kerosine	7,179	
Distillate	17,042	
Residual	6,305	
Total	51,195	

*Not reported.

of refiner-marketers, who report their inventories to the Bureau of Mines.

Probability basis . . . The figures are based on a "probability sample" of three groups of firms holding secondary inventories, based on a 1948 list of jobbers, and do not reflect jobbers entering business since that year except where they took over the facilities or business of a predecessor. The bureau believes, however, that its figures will be accurate within 1 or 2 per cent.

Penn Grade Hike Denied

WASHINGTON.—Increases in ceiling prices for Pennsylvania grade crude oil has been denied by the Office of Price Stabilization.

The OPS decision was announced by Price Director Tighe E. Woods in a letter to R. J. Brennan, general chairman of the Pennsylvania Oil Producers Committee.

Woods said the evidence submitted with the committee's petition did not justify an increase, but promised further consideration if additional data could be supplied.

Payments Held Taxable

WASHINGTON.—Lump-sum payments received by landowners for mineral rights in which they retain a royalty interest have been held by the Internal Revenue Bureau to be taxable as ordinary income and not as proceeds from the sale of a capital asset.

The bureau's decision, based on Supreme Court opinions, was issued in passing on the tax status of a payment received by a taxpayer purportedly for fee simple title to all minerals in and under his land but in conjunction with which he reserved a royalty interest in any oil produced from the land.

The Supreme Court, the bureau pointed out, has repeatedly taken the position that where, in consideration of a lump-sum payment and stipulated royalties payable out of production, a grantor extends to a grantee a right to enter upon land for purposes of exploitation of the minerals, the lump-sum payment constitutes an advance royalty taxable as ordinary income.

PAD Officials in Europe

WASHINGTON.—A survey of western European refining facilities is being made by J. E. Brantly, assistant deputy administrator in charge of foreign petroleum operations for the Petroleum Administration for Defense, and W. Vaughn Ischie, director of the foreign refining division.

The two PAD officials will visit the United Kingdom, France, Italy, the Netherlands, Belgium, and Germany.

During the trip, Brantly, who is United States representative on the petroleum-planning committee of the North Atlantic Treaty Organization and a special consultant to the ambassador at large to NATO, will attend a meeting of the committee in Paris on October 2. From there he will go to Scheveningen, Netherlands, as an American delegate to a meeting of the petroleum committee of the International Labor Organization which opens October 14.

Foreign Engineers on Tour of United States

Two French and one Belgian engineers are shown here in Tulsa on a tour planned as a study of United States petroleum operations. They are a part of a group of 24 technical men from Europe here under sponsorship of the Mutual Security Administration. Left to right in the picture are Barton Meyers, of the International Petroleum Exposition, presenting invitations to the I.P.E.; Richard van Cauteran, professor of mechanical engineering at the University of Louvain, Belgium; John S. Archer, representative of the National Management Council; Jacques Andrault, chief refinery engineer of Ste. Generale des Huiles de Petrole, Paris; Pierre Sauvage, technical manager of storage and pipes, Ste. Francaise des Carburants, Paris; and J. C. Stirling, of Service Pipe Line Co., which was host to the group during their Tulsa visit.

NPC Cancels Meeting

WASHINGTON. — The National Petroleum Council will forego its October meeting because of the many other gatherings of oil and gas groups during the month.

The final meeting of the 1952 has been called by Chairman Walter S. Hallanan for December 9, at which time a number of committees studying special problems are expected to have reports ready for submission.

FTC Report Condemned

SAN FRANCISCO. — The recent Federal Trade Commission report on the international petroleum industry is "a compound of ignorance and malice —telling an imagined story with subtle innuendoes," James Terry Duce, vice president of Arabian American Oil Co., said here last week.

The result is that the unwary are led to confuse prejudiced opinion with fact, he said.

The Aramco official, a veteran and widely known geologist who has been associated for many years with oil development in Latin America and the Middle East, made these remarks in a talk at a forum held by the Pacific Coast Conference on Private Capital Investment in International Development.

As for the current federal grand jury investigation of the international oil companies, Duce asked if it is seriously claimed that United States laws extend into foreign countries.

"If so, it is a dangerous business," he said. "It may stop construction action in the interim while such maneuvers proceed, and oil developments everywhere abroad may experience a creeping paralysis. The source of funds necessary to explore, drill wells, build plants and pipe lines to meet the ever growing demand of our motor age may well dry up."

PAD Acts to Aid Brokers

WASHINGTON. — The Petroleum Administration for Defense last week disclosed the identity of oil and gas operators who have received allotments of conversion casing and tubing. This was done to aid brokers and others interested in developing that type of business.

But Deputy Administrator J. Ed Warren warned operators to exercise care in selecting their agents because "the opportunities for quick profits offered by the conversion process have attracted persons of questionable honesty and reliability into the field."

The reliable brokers, Warren said, perform a useful service for the oil industry, acting as middlemen between the steel industry and oil and gas operators to work out arrangements for purchase of basic steel shapes and forms from one mill for its fabrication into casing and tubing in another.

World Production Drops

Major non-Communist producing countries record declines during month; Kuwait, an exception, reaches new record

Dahl M. Duff

MARKED declines in output were shown by most of the major crude-oil producing countries of the free world in July.

United States production was down 107,000 bbl. daily, Venezuela, 21,000 bbl. daily, Iraq, 81,600 bbl. daily, and Saudi Arabia, 48,500 bbl. daily. Elsewhere, the increases that occurred were slight or negligible with the exception of Kuwait, where crude production rose to a new all-time high.

Total non-Communist world production was off 204,100 bbl. daily from the previous month, a decline of nearly 2 per cent. As compared with July 1951, the month's production represented an increase of only 3.5 per cent. The average was 11,110,700 bbl. daily.

The production drops reflected both operational factors and market demand considerations. In Venezuela, it was the second consecutive month that crude production had declined due to the weak market for heavy fuel oil, particularly on the East Coast of the United States. The sharp fall in production in Iraq was understood to be due to operational difficulties. In the United States the production responds to proration changes.

Including Russia and its Communist satellite countries, aggregate world production in July totaled 12,195,800 bbl.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total foreign less Russia and E. Europe
August	2,388.0	1,789.7	4,555.3
September	2,396.3	1,741.7	4,517.6
October	2,395.6	1,810.6	4,585.6
November	2,383.7	1,940.4	4,709.5
December	2,404.9	1,846.3	4,633.1
January	2,432.3	1,832.8	4,653.5
February	2,438.8	1,860.1	4,692.0
March	2,437.8	1,996.5	4,813.8
April	2,459.6	2,090.8	4,933.2
May	2,527.6	2,142.1	5,059.9
June	2,517.8	2,208.9	5,117.6
July	2,496.7	2,127.1	5,020.7

WORLD CRUDE-OIL PRODUCTION
(In thousands of barrels daily)

Country—	July 1952	June 1952	July 1951
Western Hemisphere:			
Argentina	68.0	67.5	68.5
Bolivia	1.5	1.5	1.3
Brazil	1.8	1.8	2.4
Canada	192.5	190.3	157.9
Chile	2.4	2.2	2.5
Colombia	108.6	108.5	106.4
Cuba	0.1	0.1	0.3
Ecuador	7.8	7.8	7.7
Mexico	207.0	210.4	213.8
Peru	46.0	45.5	46.2
Trinidad	57.5	57.6	57.3
Venezuela	1,803.5	1,824.6	1,717.1
Total	2,496.7	2,517.8	2,381.4
Europe and Africa:			
France	7.3	7.3	6.1
French Morocco	2.1	2.1	1.6
W. Germany	34.8	34.4	26.6
Italy	1.2	1.2	0.4
Netherlands	14.1	13.7	14.7
Egypt	45.0	45.0	45.4
United Kingdom	1.1	1.1	0.9
Total	105.6	104.8	95.7
Middle East:			
Bahrein	30.0	30.0	30.1
Iran	31.0	31.0	115.8
Iraq	337.0	418.6	173.9
Kuwait	810.2	763.0	646.0
Qatar	68.1	67.0	47.5
Saudi Arabia	850.5	899.0	820.1
Turkey	0.3	0.3	0.4
Total	2,127.1	2,208.9	1,833.8
Other Asia:			
British Borneo	105.0	104.3	102.0
Burma	2.4	2.4	2.0
India	6.0	6.0	5.0
Indonesia	163.0	159.0	157.2
Japan	6.2	6.0	7.3
New Guinea	4.8	4.5	5.0
Pakistan	3.9	3.9	3.0
Total	291.3	286.1	281.5
Total foreign less Russia and other Communist-controlled areas	5,020.7	5,117.6	4,592.4
United States	6,090.0	6,197.2	6,140.7
Total, non-Communist areas	11,110.7	11,314.8	10,733.1
Est. Russia and other Communist areas:			
Austria	45.0	45.0	37.0
Romania	90.0	90.0	85.0
Russia	925.0	925.0	800.0
Other Communist areas	25.1	25.1	24.3
Total	1,085.1	1,085.1	946.3
World total	12,195.8	12,399.9	11,679.4

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Completely current reports also are lacking for certain countries of Southeast Asia. Data for earlier months have been revised where necessary. Other Communist areas comprise Albania, China, Czechoslovakia, Hungary, Poland, and Yugoslavia.

daily. This is some 516,000 bbl. daily over production in July 1951. The increase over the 12 months amounts to 4.4 per cent—considerably below the annual gains that have been shown by the world-wide industry during the last 3 years.

Middle East . . . Of the three main areas in the Middle East, only Kuwait showed an increase. Kuwait's output climbed to an average of 810,200 bbl. daily. This compares with 763,000 bbl. daily during June. The previous high for Kuwait was in March when the shaikhdom had an output averaging 784,000 bbl. daily.

Saudi Arabian production in July was off 48,500 bbl. daily from the record high total of 899,000 bbl. daily during the previous month. The fall in output in Iraq interrupted a succession of increases which have occurred monthly since the construction of the new 30 and 32-in. pipe line to the Mediterranean was completed in April.

The July decline in Iraq's Kirkuk field was expected to be quickly recovered. Of the month's production, 281,900 bbl. daily came from Kirkuk field compared to 366,700 bbl. daily in June, and 44,600 bbl. daily from Zubair compared to 42,200 bbl. daily in June. The remaining output of about 10,000 bbl. daily comes from Khanaqin field in eastern Iraq.

Western Hemisphere . . . In the Western Hemisphere, Canada established its third successive production record, showing an increase of about 2,200 bbl. daily to an estimated 192,500 bbl. daily in July. Canadian output is scheduled to continue at a relatively high level until shipping closes on the Great Lakes and curtails throughput through the Interprovincial line.

Venezuela's production during July averaged 1,803,500 bbl. daily as compared to 1,824,600 bbl. daily in June and 1,844,400 bbl. daily during the record high month of May. Weekly production figures in Venezuela during July were: week ended July 7, 8,809,500 bbl. daily; July 14, 1,812,900 bbl. daily; July 21, 8,803,300 bbl. daily; and July 28, 1,777,300 bbl. daily.

Production by operators in Venezuela during July was (government figures):

Company	July	June
Creole	782,552	813,115
Shell	567,462	560,585
Mene Grande	274,350	277,527
Socony-Vacuum	59,151	58,471
Mercedes	25,626	25,440
Texas	21,149	19,524
Richmond	23,425	20,911
Atlantic	17,071	18,558
Sinclair	11,723	11,915
Phillips	9,807	10,031
Pantepec	9,897	7,654
B.C.O.	941	911

Colombia's crude production showed virtually no change from the previous month. Production by companies was: Empresa (De Mares) 34,940 bbl. daily; Shell 39,018 bbl. daily; Texas, 4,363 bbl. daily; and Colpet, 30,300 bbl. daily. In addition to this crude output, condensate production at De Mares amounted to about 2,300 bbl. daily.

Crude production in West Germany continued its steady upward climb. The month's total equivalent to about 34,800 bbl. daily represented a new record. Of interest was the continued expansion in production in Italy, most of which is by the Italian Government company, AGIP. The July output of about 1,200 bbl. daily, though only a fraction of total Italian demand, is three times as great as a year ago.

MIDDLE EAST

Report on Iran

Jones says he made no agreement, wanted only to help get oil facilities operating again; British critical of trip

WALTON JONES, president of Cities Service Co., was expected back in the United States late last week after his visit of about a month in Iran.

Some of the speculation which surrounded Jones' presence in Teheran was quieted when he met press representatives in the Iranian capital and declared that his motive in going to Iran was to see if he could be "of any assistance in getting the Iranian oil industry back into operation."

Jones turned up in Teheran in mid-August. He visited the nationalized properties of Anglo-Iranian Oil Co., Ltd., at Abadan and conferred with Prime Minister Mossadegh and other Iranian officials. In his party were Al Frame, Cities Service refining official and former assistant deputy administrator of the Petroleum Administration for Defense; J. E. Heston, in charge of crude production for Cities Service; R. V. Whetzel, manager of the company's foreign department; and John M. Robeson, Jones' private secretary.

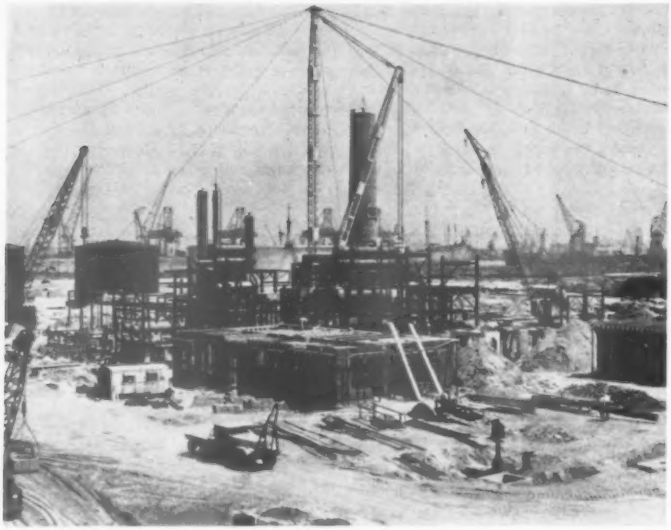
No agreement . . . In his interview in Teheran, Jones indicated that he might be willing to assist Iran in resuming oil operations and buy oil from Iran, regardless of the British threat to take legal action against any purchasers on grounds that it still holds legal title to the oil. However, Jones denied making any agreement or commitment of any kind with the Iranian Government and said he had discussed the purchase of oil only as "a remote possibility."

"I cannot expect newspapermen to believe it because they are born skeptics but I can tell you truthfully my motive in coming here was not to try and make a fast dollar for Cities Service," Jones told the press group. "My associates and I honestly wanted to see if we could be of any assistance in getting the Iranian oil industry back into operation."

The Cities Service head said he had

Guests of the Los Angeles Nomads

Foreign guests at the September meeting of the Los Angeles chapter of Nomads included, front row, left to right: E. W. Conn, R. M. Parsons Co., India; John L. Everett, Mene Grande Oil Co., Venezuela; Carlos Osorio, consul of Chile; Herbert E. Allred, Socony-Vacuum Oil Co., Inc., Venezuela; and Harold G. Karnes and L. E. Miles, both of Iraq Petroleum Co., Iraq. In the back row are A. E. Giles, Standard Vacuum Oil Co., Sumatra; Bud Miles, International Petroleum Co., Colombia; W. C. Lance and J. O. Donovan, both of Iraq Petroleum Co., Iraq; Arthur R. Phillips, Australasian Petroleum Co., Papua; and Larry D. Cannon, Drilling & Exploration Co., foreign division.



Work Pushed at Antwerp

Indicative of the continued expansion of refinery capacity in Europe is this view of progress on the new 25,000-bbl. plant being built by Esso Standard Refinery, S.A., at Antwerp in Belgium. The refinery is expected to come on stream the second quarter of next year. Its fluid catalytic cracking unit of about 8,000 bbl. daily capacity is of the Model IV, combination type, and will be the first of this design to come into operation outside the United States and Canada. The refinery also includes about 4,000 bbl. daily reforming capacity. It is the second major refinery for Antwerp. Last summer, another new plant, now processing about 40,000 bbl. daily, was placed in operation by a company representing Anglo-Iranian Oil Co., Ltd., and Petrofina.

not received any request from the Iranians for tankers. However, he remarked that some tankers could be moved in immediately and that in a matter of months enough could be moved in to make the industry operation a paying proposition.

When it was pointed out that the only tanker to lift Iranian oil thus far was impounded by a injunction suit by the British at Aden, Jones said this "will not happen to my tankers." "If you mean that I will be sued by the British, I might, but I will not lose much sleep over that."

Jones said he had no disapproval of his visit to Iran from the U. S. Government. "Certainly I would not be here if they had disapproved." When asked if the British had objected to his trip, he replied: "I will let you guess."

Report on facilities . . . Jones said his report on the steps necessary to reactivate the Iranian oil industry was substantially complete. A preliminary report had been given Dr. Mossadegh but the final report, he said, awaits his return to the United States.

He said there were no signs of sabotage or looting at Abadan and that the properties were in good condition. He estimated it would take $10,000,000 to restore the refinery to full operation. He found the Iranian engineers in charge well trained but needing advice in highly technical operations. He said any advisers sent by Cities Service would be the best available and not necessarily all Americans.

Jones described the shutdown of the Iranian oil industry as a "world tragedy" but refused to be drawn into a discussion of the rights and the wrongs of the issue. He said that even if no settlement were reached with Anglo-Iranian, it is likely that some oil may move toward America. Looking down the road in the future, he said, he could see an American market for some Iranian oil.

Jones' statement that he had made his trip in a purely private capacity was backed up the following day by a State Department spokesman in Washington. This official said his mission was a purely private commercial venture and that Jones had not "asked us for any help."

British critical . . . In London, the British view generally was that Jones' appearance in Teheran had further encouraged the Iranians in the belief that they could operate the industry on their own.

Furthermore, Jones was held to have made his visit to Teheran at the worst possible time, that is, when the Iranian Government was considering an answer to the joint British-American proposals for a settlement. These terms have been virtually rejected, but some observers of the situation feel that the outcome of the situation would have been the same regardless of Jones' visit.

It was clear that the somewhat passive attitude of the British to Jones' visit would quickly change if any attempt were made under his sponsorship to ship nationalized oil out of the country and into export markets. British Foreign Office spokesman said any further efforts to move oil out of Iran in defiance of the warnings of legal action would be resisted.

Industry attitude . . . Informed opinion in New York was that, even if Jones were so inclined, Cities Service alone is in no position to handle and absorb a substantial volume of Iranian oil.

The company buys up to about 100,000 bbl. daily of crude for its own refining requirements, but much of this is presumably on long-term purchasing contracts with producers in this country. Much of the company's refining capacity is on the Gulf Coast and inland. Furthermore, while the company owns and charters a total of 22 tankers, these are needed largely for the transportation of products from the Lake Charles refinery to the East Coast.

Although Jones denied in his interview in Teheran that he had discussed the price for oil with Iranian officials, this question was brought to the attention of the industry by reports that National Iranian Oil Co. has been offering crude, f.o.b. Iran, for $8.70 a ton.

This is equivalent to about $1.14 a barrel and is comparable to the going price in the Persian Gulf of about $1.75 a barrel. At the present level of open-market tanker rates and duties, it appeared that Iranian crude bought for this figure could be laid down competitively on the East Coast of the United States.

Iran Squelches Offer

The Iranian Government last week formally answered the joint American-British oil-settlement offer by making a renewed demand that it be paid $137,200,000.

Iran proposed that this sum be paid to it by Anglo-Iranian Oil Co., Ltd. Iran said it would refund the money

if it was later held in arbitration that its claim is invalid.

The Iranian answer made the possibility of settlement of the dispute even more remote. Britain considers that Iran has no basis whatever for demanding the $137,200,000. This is money which Anglo-Iranian set aside to pay Iran in case of ratification of the supplemental concession - revision agreement of 1949. The agreemeent was never approved or placed in effect, and Anglo-Iranian has pointed out that the money has been spent expanding facilities elsewhere to make up for loss of its nationalized properties.

LATIN AMERICA

New Oil Law

Brazil's industry near to becoming a state monopoly

THE pending Brazilian bill creating a state petroleum monopoly is believed almost certain to pass the upper house of the congress and become law in the near future.

The measure was approved by the Chamber of Deputies September 19 and sent to the Senate. It was originally introduced by the Vargas administration, but its nationalistic features excluding foreign capital from participation were made even more stringent later by amendments in the chamber.

Brazilian political factions which have campaigned against the foreign petroleum industry for years have gained new strength from an unexpected source. The recently released Federal Trade Commission report in the United States is being used by these groups as further justification for their position.

Exceptions . . . The bill as passed by the chamber of deputies excludes importing and marketing from the state operation. The foreign companies importing products provide about 98 per cent of Brazil's growing petroleum demand, and the economy of the country obviously depends on their continued functioning.

The bill creates a Brazilian Petroleum Corp. (Petrobras) with the National Petroleum Council continuing as the top policy group. Exploration, production, refining, and inland transportation of petroleum is declared a state monopoly. The Brazilian interests now building refineries at Rio de Janiero and at Sao Paulo are exempt but only until terms of their concessions expire.

With the only domestic production consisting of the relatively small output of the National Petroleum Council, Brazil recently has faced a serious dollar shortage due largely to petroleum imports.

EUROPE

German Wildcats Hit Pay

The German company, Preussag, has struck oil at Lehrte, east of Hanover, and at Vorhop, east of Wesendorf field in West Germany.

Preussag's well, Lehrte 12, discovered oil in the Cornbrash sandstone at 1,193-1,227 m. (about 4,000 ft.). Production tests are still in progress. Initially Lehrte 12 flowed light crude at relatively high pressure.

Vorhop 5c, about 9 km. west of Wesendorf field, found oil in the Dogger. The well, located at the southeast end of the Vorhop salt dome, tested at a rate of 1-2 cu. m. (6.3 to 12.6 bbl.) daily. Vorhop is owned by Preussag and the Elwerath company.

Another German exploratory success was Rehden 5, drilled by Wintershall, in the area between the Weser and Ems rivers near the village of Rehden, which found natural gas at 1,150 m. (about 7,000 ft.). Production test showed 90,000 cu. m. (about 318,000 cu. ft.) daily through a 5 mm. choke. The gas came from the Zechstein dolomite. The company is negotiating for the sale of the gas and has yet to test the Platten dolomite where even more promising shows of gas have been encountered.

Antwerp Project Under Way

Work is now under way on expansion and modernization of the Antwerp refinery operated by "Albatros" S.A. Belge pour de Raffinage de Petrole. The project includes extension of crude-oil distillation facilities, installation of a Houdriflow unit and cat poly plant.

Currently the "Albatros" refinery is equipped with a 3,500-bbl. per day topping unit. With the new facilities in operation the plant will be the third largest in Belgium having a crude-oil input rating of 11,000 bbl. daily. Capacity rating on the new cat unit is 3,650 bbl. per day. Completion schedules are set for the 1953-54 period.

French Line Nears Completion

The 140-mile, 10-in. products pipe line connecting Paris and the port of La Havre has been completed between the two cities but has not yet entered the city of Paris.

The line is unique among the world's products lines in the manner in which it will deliver to a large number of bulk stations within a metropolitan area. After reaching Paris, the line makes a wide semicircle around the city. It is designed to provide maximum accessibility to product-distribution points.

It is being built by Soc. des Transports Petroliers par Pipe Line. Deliveries are expected to begin before the end of the year.

World Briefs

The Danish Government is negotiating with Danish American Prospecting Co. (Gulf) with a view to exploiting salt deposits discovered by Danish American during oil exploration near Randers in North Jutland, according to a report from Copenhagen. It was said Gulf is prepared to undertake salt mining only in case its efforts to find crude production are successful. Denmark is now wholly dependent on salt imports from abroad, about two-thirds of the total coming from Germany.

The new reforming unit at the Bottrop - Welheim hydrogenation works owned by Ruhroel, GmbH., has been completed and after preliminary tests has been placed on regular production. The unit, built to Ruhroel's own design, will improve the quality of straightrun gasoline produced in the topping process and desulfurize it. The plant operates on Saudi Arabian crude.

The German company, Emsland Erdoelleitung, GmbH., has begun construction of a 13½-mile crude-oil pipe line from Osterwald to the refinery and harbor of Holthausen near Lingen. The line, 5 in. in diameter, will be laid aboveground and will be insulated. Annual throughput capacity will be about 6,000 to 8,000 bbl. daily. Completion is expected by the end of the year, including the pumping facilities at Osterwald.

The legal case brought by Anglo-Iranian Oil Co., Ltd., against the tanker Rose Mary for lifting a cargo of Iranian crude is dragging on at Aden. A judge of the Adenese Supreme Court said a hearing probably would be held the early part of December. Several motions in the case have been heard already. The Rose Mary, a small vessel of less than 1,000 tons, picked up a load of Iranian crude in May on behalf of Italian interests. It was the first export since the nationalization. Anglo-Iranian, which has distributed worldwide warnings that it still holds legal claim to Iranian oil, attached the vessel and its cargo when it put in at Aden.

Returns From Iran

Cities Service head long has been key oil figure

EVEN before W. Alton Jones' much-publicized trip to Iran, his name was a prominent one in the oil industry.

The 61-year-old president of Cities Service Co., who was scheduled to return late last week after conferring with Iranian officials on the country's now-dormant oil industry, got his start in the oil business in 1921. At that time he left the Missouri Ozark country to become assistant to the late Frank W. Frueauff, a partner in the Henry L. Doherty Co., New York.

The Doherty company, later to become Cities Service, then consisted of small gas, electric, and railway traction properties.

In 1927 Jones was elected first vice president, a position he held until 1940. For the past 12 years he has been president, director, and a member of the executive committee.

He was called to Washington in World War II when Nazi submarines were sinking oil tankers along the American coast. As president of the War Emergency Pipelines, Inc., he supervised building of the "Big Inch" and "Little Big Inch" pipe lines, which insured continuous flow of oil from Texas fields to the East.

Later, when the need for aviation gasoline became critical, the government loaned Cities Service $75,000,000 to build a refinery at Lake Charles, La. For his war services he received the Presidential Certificate of Merit in February 1948.

To keep up with Cities Service's many interests Jones travels extensively in a private plane. It's been estimated he covers more than 150,000 miles in a year.

Jones is president of Empire Gas & Fuel Co., chairman of the board of Cit-Con Oil Corp., Cities Service Oil Co. (Pa.), Cities Service Research & Development Co., and Cities Service Refining Corp., and a director of Arkansas Fuel Oil Co., Richfield Oil Corp., and Chrysler Corp. He also holds offices in several other oil concerns.

Thomas E. Stockdale has been appointed, effective October 1, manager of the new refinery which Standard Oil Co. (Ind.) plans to build at Mandan, N. D. Since 1942 he has been general superintendent of Standard's Wood River, Ill., refinery. He will be succeeded by **Dr. Ford H. Blunck,** manager of the projects, capital expenditures, and miscellaneous-contracts division in the general-office manufacturing department at Chicago.

James B. Roche has resigned as an engineer for the Railroad Commission of Texas to open the Oil & Gas Producers Service. In addition to providing service on commission applications and reports, the concern will make gas-oil ratio, potential, and gas-well tests.

Stanton K. Smith, president of Smith Oil & Refining Co., Rockford, Ill., will be national chairman of the Oil Industry Information Committee in 1953. He will succeed **Charles E. Hardwick,** vice president of Ohio Oil Co., Findlay, Ohio. Smith will take office January 1. Two new vice chairmen named were **W. J. Loufman,** president of Fleet Wing Corp., Cleveland, Ohio, and **C. Haines Finnell,** director of public relations and advertising, Union Oil Co. of California, Los Angeles.

L. B. Parker, senior civil engineer for Humble Oil & Refining Co., Houston, has been transferred from the gas-construction division to the Clear Lake construction district as district civil engineer.

H. Wayne Hoylman and **William L. Morris** have formed Hoylman-Morris, a consulting firm specializing in geophysical and petroleum production. Since 1950 Hoylman has had an independent consulting practice in Los Angeles. Morris formerly was head of the theoretical group in the atomic-energy division of Phillips Petroleum Co.

J. B. Ladd has been promoted to district petroleum engineer for The Texas Co. at Craig, Colo.

L. O. Wirings, Shell Oil Co., has been promoted to Houston area geologist on special assignment.

Milner Reed, Shell Oil Co., has been transferred to East Texas as division exploitation engineer.

R. N. Freehling has been appointed district petroleum engineer for The Texas Co. at Casper, Wyo., replacing **John B. Flugstad,** who resigned. The district embraces Wyoming, northeastern Colorado, and Southwest Nebraska.

Roy Young, petroleum engineer for Ohio Oil Co., has been transferred from Bay City, Tex., to the Houston office.

E. L. Cralle, engineer for Cities Service Oil Co. at Graham, Tex., has been promoted to assistant division engineer at Oklahoma City.

Clyde Perry, formerly superintendent of the Cuyama Valley district of Richfield Oil Corp., has been appointed assistant manager of the northern division and transferred to Bakersfield, Calif. **C. A. Davis,** formerly production engineer for the San Joaquin Valley district, Bakersfield, succeeds Perry as Cuyama superintendent.

A. L. Lyman, California Research Corp., Richmond, Calif., has been elected chairman of the petroleum division of the American Chemical Society. **Dr. F. D. Rossini,** Carnegie Institute of Technology, Pittsburgh, Pa., has been elected chairman-elect, and **Dr. A. G. Oblad,** Houdry Process Corp., Marcus Hook, Pa., secretary-treasurer. Area representatives are: **Dr. W. E. Bradley,** Union Oil Co. of California, Brea, Calif.; **Dr. S. S. Shaffer,** Humble Oil & Refining Co., Baytown, Tex.; **Dr. E. C. Hughes,** Standard Oil Co. of Ohio, Cleveland; **Dr. W. J. Coppoc,** The Texas Co., Beacon, N. Y.; **J. S. Rearick,** M. W. Kellogg Co., New York, and **S. W. Ferris,** Sun Oil Co., Marcus Hook, Pa.

J. O. Sanders, operating superintendent of the North Louisiana-Mississippi division of The California Co., has been appointed Gulf Coast division superintendent. **R. E. France** has been named acting operating superintendent of the North Louisiana-Mississippi division. **E. W. Harter** has been appointed Gulf Coast division petroleum engineer.

PERSONALS

Desk and Derrick Officers

New officers and directors of the Desk and Derrick Clubs of North America, who will take office next January, were elected at the association's first annual convention at the Shamrock Hotel in Houston September 12 and 13. Left to right are Mrs. Ruth Palmer, Rocky Mountain Oil and Gas Association, Casper, Wyo., director, Region IV; Miss Doris Whiteside, Texas Mid-Continent Oil and Gas Association, Dallas, director, Region VI; Mrs. Lamont Tofte, Texas Seismograph Co., Wichita Falls, Tex., treasurer; Miss Frances Crawford, Brunini, Everette, Gantham & Quin, Vicksburg, Miss., secretary; Mrs. Irene Stimson Cox, Panhandle Producing Co., San Antonio, Tex., first vice president; Miss Margaret Neff, Dixie Geological Service, Jackson, Miss., president; Miss Anne Curren, Ohio Oil Co., Tulsa, second vice president; Miss Eleanor Crockett, Royalite Oil Co., Ltd., Calgary, Alta., director, Region VII; Miss Carol Eberhart, The Texas Co., New York City, director, Region I; Mrs. Lillian Tucker, Pan American Production Co., Shreveport, director, Region III; Miss Maxine R. Hacke, Warren Petroleum Corp., Tulsa, director, Region II. Missing from the picture is Mrs. Florence M. Hopkins, United Geophysical Co., Pasadena, Calif., director, Region V.

J. L. Tatum, independent geologist, has moved from Albuquerque, N. M., to Durango, Colo.

H. V. Sansom has resigned as manager of the shipping department of Eagle Oil & Shipping Co., Ltd., British firm, to take up a post abroad. He will be succeeded by **S. G. Read,** who has been assistant manager since February 1951.

George Doying has been appointed executive secretary of the Pennsylvania Natural Gas Men's Association.

William A. Adent, formerly district geologist for Bankline Oil Co., has joined the staff of William Ross Cabeen & Associates at Midland, Tex.

S. C. Sandusky, petroleum engineer for Ohio Oil Co. at Houston, has been appointed division reservoir engineer at Shreveport.

M. R. Rosenlieb, Del Valle field production foreman for Ohio Oil Co. at San Fernando, Calif., has been promoted to superintendent of the Santa Clara Valley area at Fillmore, Calif.

G. E. Wegner has been elected vice president of Willingdon Drilling & Exploration Co., Inc., in charge of operations in the Williston basin.

Robert J. Painter has been elected executive secretary and **Raymond E. Hess** associate executive secretary of the American Society for Testing Materials. Their election followed the report of a special committee named to recommend a successor to the late C. L. Warwick. Hess formerly was assistant executive secretary and editor, and Painter formerly was treasurer and assistant secretary.

C. J. Barkley, subsurface geologist for Shell Oil Co. at Houston, has been transferred to the Pacific Coast area.

G. H. Rowe, drilling and production superintendent for H & H Drilling Co., has been transferred from Newcastle, Wyo., to Wibaux, Mont.

Marshall R. Young, Fort Worth, president of Roeser & Pendleton, Inc., independent oil firm, has been elected to the board of directors of the Tennessee Gas Transmission Co. He also is a member of the board of directors of Continental National Bank of Fort Worth.

E. D. Wingfield, vice president of Freeport Sulphur Co., New Orleans, and **N. H. Wheless,** president of Wheless Drilling Co., Shreveport, have been added to the petroleum division of the southwestern regional advisory committee of the National Association of Manufacturers.

Arthur S. Grossman, a partner of Straus, Blosser & McDowell, Chicago, has been elected a director of Byrd Oil Corp. **D. Gordon Rupe, Jr.,** president of Dallas Rupe & Son, Dallas, and **Mark J. Millard,** a partner of Carl M. Loeb, Rhoades & Co., New York, also have been elected directors.

F. A. Coyle, formerly a tool pusher for Kemp Drilling Co., Inc., at Natchez, Miss., has been appointed drilling and production superintendent for D. E. Vasser Drilling Co. there.

Glen R. Harsh, assistant division superintendent for Cities Service Oil Co. at Oklahoma City, has been appointed assistant general superintendent of production at Bartlesville, Okla.

Erd M. Johnson, an engineer for Payne County Drilling Co. at Cleveland, Okla., has been called to active duty with the Air Force for 2 years. He is stationed at Patrick Air Force Base, Florida.

Henry B. Beard, assistant foreman for Magnolia Petroleum Co. in the Falfurrias, Tex., producing district, has been promoted to production foreman of the company's Brownfield district in West Texas. Other Magnolia Petroleum Co. changes include: **Garland C. Rutherford,** production foreman in the Brownfield district, transferred to the Pegasus producing district, and **Ernest W. Hardt,** assistant foreman in the Alice producing district, appointed production foreman in the Falfurrias district.

Charles De Blieux, independent oil man, has been elected president of the New Orleans Geological Society. Other officers elected for a 1-year term are: **W. K. McWilliams,** Superior Oil Co., vice president; **Orval W. Noland,** Humble Oil & Refining Co., secretary; and **Lewis P. Kilbourne,** The Texas Co.,

PERSONALS

treasurer. **Les Bowling,** independent, was elected to a 3-year term as director. The new officers will be installed October 6.

Bernard Moroz, engineer for British-American Oil Producing Co., has been transferred from Seymour, Tex., to Sterling, Colo.

J. E. Bucy has been transferred from Snyder, Tex., to Denver as Rocky Mountain production manager for Lion Oil Co.

M. E. Hankins has been appointed divisional purchasing agent at New York by The Texas Co., succeeding **F. G. Schlemmer,** resigned. Hankins formerly was divisional purchasing agent at Chicago.

Joe Dickerson, vice president of Shell Oil Co., has been named chairman of the Midland, Tex., 1952 Community Chest campaign.

I. D. Modisett has resigned as roustabout foreman for Gulf Oil Corp. at Longview, Tex., to become owner and manager of Modisett & Son Well Servicing of Velma, Okla. He was with Gulf 15 years.

Edwin A. Desmond has been named head of a new section in the technical service division of Ethyl Corp. to deal with diesel engines, diesel fuels and diesel fuel additives.

J. J. Pitts, party chief for Robert H. Ray Co., has been transferred from Aberdeen, Miss., to San Angelo, Tex.

Harry W. Frazee, Little Rock, Ark., has been appointed assistant general counsel for the Petroleum Administration for Defense. He joined PAD in June 1951 as counsel for the refining division.

C. H. Stover of London, leader of a reconnaissance squadron in World War II and with the Shell Oil Co. of Canada marketing department since 1945, has been appointed head of the company's aviation department, with headquarters at Toronto.

James H. Mayes, formerly a petroleum specialist for the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, has reopened a private office in Washington as a representative of petroleum and related industries.

H. D. Brennard has been appointed assistant general manager of marketing for The California Co. at New Orleans.

James M. David, assistant reservoir engineer for Atlantic Refining Co. at Dallas, has been appointed regional reservoir engineer at Corpus Christi.

Afton M. McConnell, tool pusher for Richardson & Stewart Drilling Co., has been transferred from Port Lavaca, Tex., to Eagle Lake, Tex.

Mervin P. Boggs has been transferred from California to Glendive, Mont., as division engineer for Richfield Oil Corp. **Harold Hassel,** formerly division superintendent at Glendive, has been transferred to Calgary, Alta., where he will be in charge of all Canadian and Rocky Mountain drilling operations.

Francis L. Beard and **Roy Jobe** have organized B & J Drilling Co. at Mount Carmel, Ill.

G. H. Robertson, tool pusher for Unit Drilling Co., has been transferred from Liberal, Kans., to Alva, Okla.

W. D. Bellmon, formerly plant superintendent for Anco Gas Corp. at Palestine, Tex., has been named field superintendent for Three States Natural Gas Co. at Farmington, N. M.

DEATHS

Harold J. Buck, sales manager for American Liberty Oil Co., died September 15 in Dallas.

Halleck Wager Brust, 64, safety engineer for The Texas Co., died September 15 at his home in Long Beach.

Paul W. Kolb, 44, laboratory foreman for Union Oil Co., died September 16 in a Long Beach hospital. He came to Long Beach in 1933 from Fort Dodge, Iowa.

J. H. S. Bonner, 58, Wichita Falls, Tex., a past president of the North Texas Oil and Gas Association, died September 18 of a heart attack.

Richard Elder Eckels, 58, secretary-treasurer of Zenith Petroleum Co., died of a heart attack in Oklahoma City September 22.

John Z. McWhirter, 52, production superintendent for Haverstrite Oil Co., died in a Los Angeles hospital September 13.

Richard A. McLeon, 50, South Arkansas oil operator, died of a heart attack at his home near Norphlet September 18.

J. H. Russell, 87, pioneer oil operator, died in Wichita Falls, Tex., September 16. He was associated with the old White Oil Corp. and was one of the operators who brought in the Homer and Haynesville fields in Louisiana some 30 years ago. He also was one of the first oil men at Titusville, Pa., when that field was brought in.

G. F. Braley, 60, chief engineer for Magnolia Pipe Line Co., died at Corsicana, Tex., September 18 of a heart attack.

W. B. Corlett, 90, pioneer of the North Texas oil industry, died September 24 at Wichita Falls, Tex. He moved to Wichita Falls in 1912 from Clay County, where he was active in development of Petrolia field in 1901.

R. H. Crow, 57, president of Crow Drilling Co., died of a heart attack September 19 at New Orleans. A pioneer oil producer, he assisted in development of Smackover field.

J. B. Reese, 52, Hobbs, N. M., superintendent for Ohio Oil Co., died of a heart attack while on vacation in West Virginia. He had been with Ohio for 18 years.

Ural Adair, 43, general still supervisor for the Phillips Oil Co. refinery, died at the University of Kansas medical center in Kansas City, Kans., September 19. He had been with Phillips 21 years.

Jewett A. Decker, 60, foreman of the oil room and canning plant in the West Tulsa refinery of Mid-Continent Petroleum Corp., died September 24. He had been employed at the refinery since 1927.

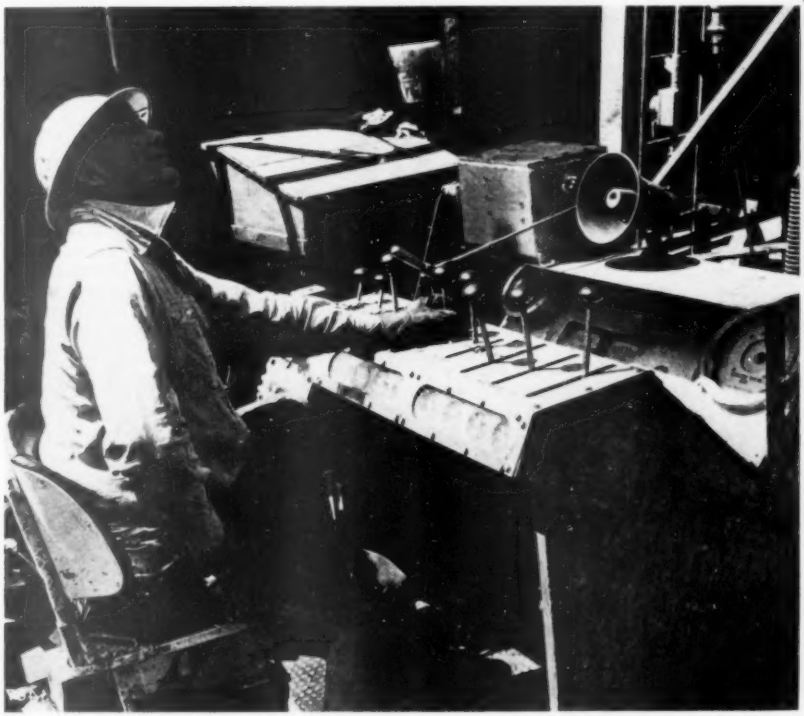
Roy Lang Weil, Sr., 59, died recently at his home in Houston of a heart attack. He was in the refining department of Esso Standard Oil Co. and had been with the company 32 years.

DRILLING!

A Special Section

- • • Active Areas—present and future
- • • Its Costs—broken down by areas
- • • Its Statistics—charted for easy use
- • • Its Techniques—engineering articles
- • • And a 25-page drilling-mud symposium

This issue distributed by The Oil and Gas Journal at the annual convention of the American Association of Oilwell Drilling Contractors



FACTS & FIGURES of the DRILLING INDUSTRY

Cost of Rigs Complete
Cost of Various Service Ratings
Dollar Volume of Drilling
Contractor-Drilled Wells
Total Footage
Operating Costs
Increased Reserves
Added Net Reserves
Depths
Contractor's Footage
Number of Wells Drilled
Footage per Employe
Number of Rotary Rigs
Footage per Running Rig
Rotary and Cable Footage

FOREWORD . . .

Kenneth B. Barnes
Managing Editor

THIS issue of The Oil and Gas Journal is one of the largest ever published on the subject of oil-well drilling. The editorial staff has worked in close cooperation with drilling contractors, oil-company drilling personnel, and manufacturers of drilling equipment and supplies. All told, there are approximately 80 pages of special material on various phases of oil-well drilling plus the regular Journal pages of field reports on important drilling wells.

Costs Up, Revenues Unchanged

The first 16 pages of this section devoted to drilling contractors and equipment, contains editorial data of broad economics and statistical interest.

The first five pages (A.A.O.D.C. data) show in detail how dominant the drilling division is as a part of the petroleum industry, and its expansion.

All parts of the oil business are competitive. All parts are efficient. All parts contribute greatly to the economy of the United States as well as all countries abroad.

The drilling business, like the other parts of the oil industry, keeps costs down and certainly no division of the business nor any industry in the American industrial picture has a better record of keeping its prices down in the face of rapid inflation and increasing costs. Look at these drilling figures:

PER CENT CHANGES IN COSTS AND REVENUE

Costs—	1941	1945	1948	1951
Labor	100	140	170	196
Equipment	100	110	145	180
Miscellaneous	100	120	165	181
Total	100	122	160	186
Revenue[1]	100	115	105	103
Speed[2]	100	105	120	140

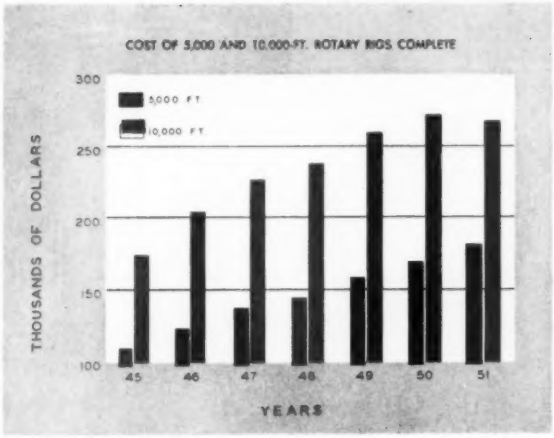
[1]Per foot drilled. [2]Rate of penetration.

TOTAL DRILLING-INDUSTRY INVESTMENT

Year	Drilling equipment: Rotary	Drilling equipment: Cable tool workover, etc.	Other equipment and facilities: Rotary	Other equipment and facilities: Cable tool workover, etc.	Total drilling investment
1945	$340,819,420	$149,289,960	$11,858,941	$5,194,870	$507,163,191
1946	358,795,768	185,776,426	12,483,375	6,464,496	563,520,065
1947	465,683,253	212,966,607	16,200,619	7,410,638	702,261,117
1948	583,653,257	194,365,078	20,308,436	6,763,357	805,090,128
1949	682,501,113	119,108,606	23,747,885	4,144,644	829,502,248
1950	751,387,534	141,970,124	26,144,814	4,940,160	924,442,632
1951	854,280,100	155,500,000	29,725,000	5,410,681	1,044,915,781

DOLLARS INVESTED IN ROTARY DRILLING INDUSTRY AND PER EMPLOYE

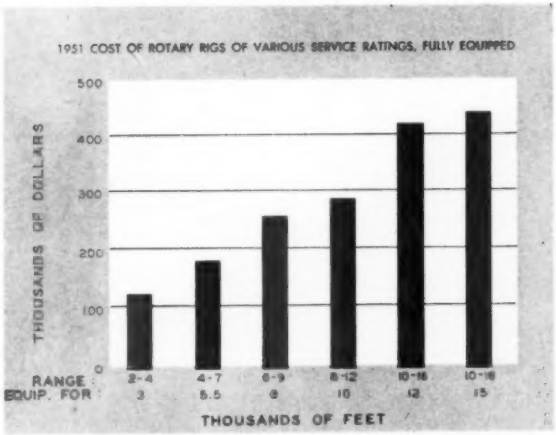
Year	Drilling equipment	Other equipment and facilities	Total drilling investment	Per employe
1945	$340,819,420	$11,858,941	$352,678,361	$10,554
1946	358,795,768	12,483,375	371,279,143	11,932
1947	465,683,253	16,200,619	481,883,872	13,598
1948	583,653,257	20,308,436	603,961,693	14,233
1949	882,501,113	23,747,885	706,248,998	17,927
1950	751,387,534	26,144,814	777,532,348	18,357
1951	854,280,100	29,725,000	884,005,100	19,336



COST OF RIGS COMPLETE

Total cost of 5,000-ft. capacity rigs completely equipped has about doubled as between 1945 and now. Total cost of 10,000-ft. capacity and other heavy type complete rigs also has gone up nearly as much.

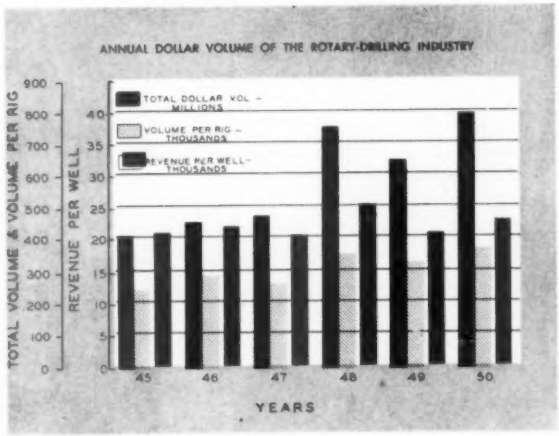
Year	5,000-ft. total cost	10,000-ft. total cost
1945	$109,478	$176,093
1946	125,900	201,785
1947	141,227	226,406
1948	147,795	238,081
1949	162,027	261,325
1950	172,975	277,495
1951	185,018	297,036



COST OF VARIOUS SERVICE RATINGS

Big rigs today cost about one-half million dollars, completely equipped. The lightest rotary rigs, completely equipped, will cost about $100,000. Other types of rotary rigs vary in between, as per the depth classification-investment costs shown.

Equipped for an average depth of (ft.)	Rotary rig, average total cost
3,000	$109,107
5,500	186,398
8,000	260,387
10,000	298,456
12,000	426,685
15,000	451,309



DOLLAR VOLUME OF DRILLING

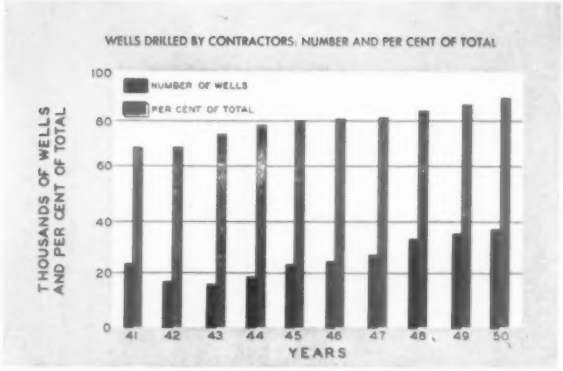
Total dollar volume for all rotary drilling has more than doubled since 1945. Average revenue per well drilled remains constant—about $23,000. Also constant is the annual dollar volume per operating rig — about $300,000.

Year	Dollar volume	Avg. per rig	Per well
1945	$404,722,395	$237,415	$22,582
1946	460,297,588	294,685	22,271
1947	480,870,832	265,968	20,694
1948	759,990,139	351,035	25,761
1949	658,209,822	327,468	21,255
1950	803,718,384	271,920	22,793

CONTRACTOR-DRILLED WELLS

More and more of the wells commenced in the United States are dug by drilling contractors. Now it is hitting at the 90 per cent mark.

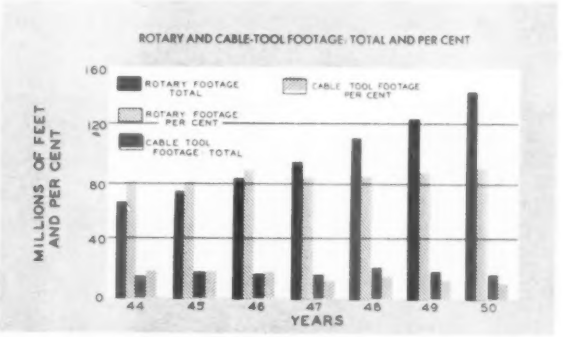
Year	No. wells	Per cent
1941	23,407	72
1942	15,393	70
1943	14,935	75
1944	19,999	78
1945	21,411	80
1946	24,080	81
1947	26,839	81
1948	32,496	82
1949	33,150	85
1950	38,485	89



TOTAL FOOTAGE

Cable footage runs about constant at 16,000,000 ft. per year. Rotary footage is now 90 per cent plus of total footage drilled in the United States.

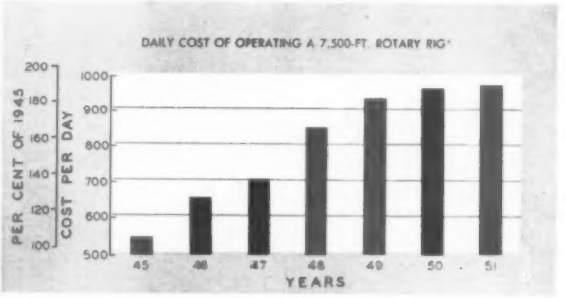
Year	Rotary footage	Per cent	Cable footage	Per cent
1944	67,176,304	81.2	15,385,696	18.8
1945	76,362,716	82.1	16,748,284	17.9
1946	82,049,481	82.8	17,041,519	17.2
1947	85,982,202	84.7	17,456,798	15.3
1948	117,463,697	85.8	19,587,303	14.2
1949	122,116,849	88.2	16,193,151	11.8
1950	143,521,135	90.7	15,814,865	9.3



OPERATING COSTS*

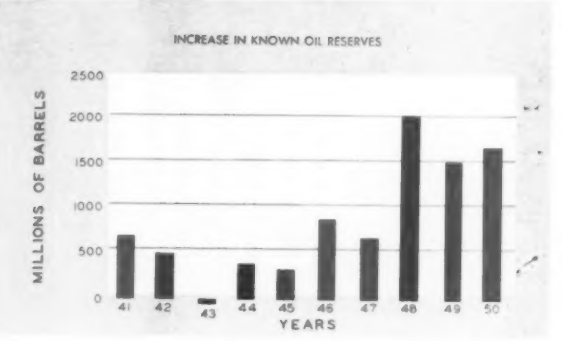
Year	Operating cost per day	Per cent
1945	$511.00	100
1946	655.00	128
1947	702.00	137
1948	854.00	167
1949	931.00	182
1950	970.00	190
1951	983.00	192

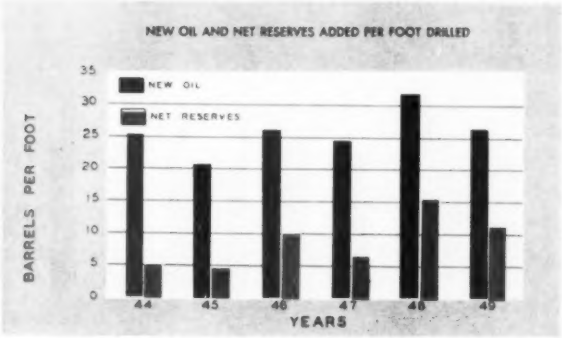
*Actual cost figures of contractor, using depreciation basis of 1,500 days, rig salvage of 25 per cent



INCREASED RESERVES

Year	Barrels
1941	564,781,000
1942	493,497,000
1943	—18,641,000
1944	389,079,000
1945	373,582,000
1946	931,714,000
1947	704,881,000
1948	2,079,567,000
1949	1,557,274,000
1950	1,157,560,000
1951	2,656,572,000

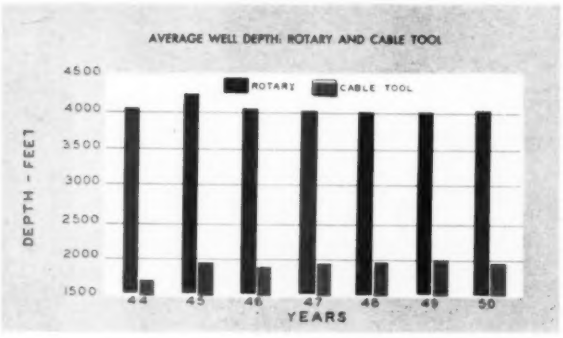




ADDED NET RESERVES

For each foot of hole cut by the drilling industry, the new oil found amounts to about 25 bbl. During the last couple of years the net reserves (after production during year) average about 11 bbl. per foot drilled.

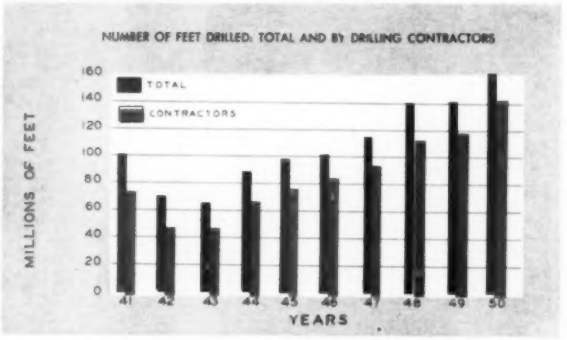
Year	New oil (bbl.)	Net reserves
1944	25.0	4.7
1945	22.6	4.0
1946	26.8	9.4
1947	23.9	6.2
1948	31.1	15.1
1949	25.8	11.3
1950	24.7	11.0



DEPTHS

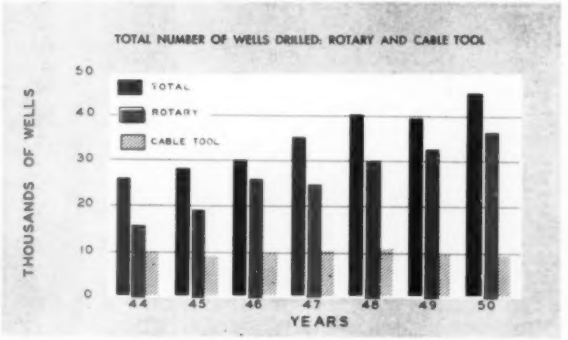
For several years now the average rotary hole in the nation runs about 4,000 ft., cable-tool holes about 1,900 ft.

Year	Rotary depth (ft.)	Cable tool (ft.)
1944	4,067	1,709
1945	4,261	1,894
1946	4,069	1,881
1947	4,133	1,962
1948	3,962	1,934
1949	3,939	2,016
1950	4,066	1,982



CONTRACTORS' FOOTAGE

Year	Total drilled (ft.)	Contractors (ft.)
1941	99,342,000	71,526,000
1942	67,900,000	47,530,000
1943	61,635,000	46,226,000
1944	82,562,000	64,398,000
1945	93,111,000	74,489,000
1946	99,091,000	80,264,000
1947	113,439,000	91,886,000
1948	137,051,000	112,382,000
1949	138,310,000	117,564,000
1950	159,336,000	141,809,000



NUMBER OF WELLS DRILLED

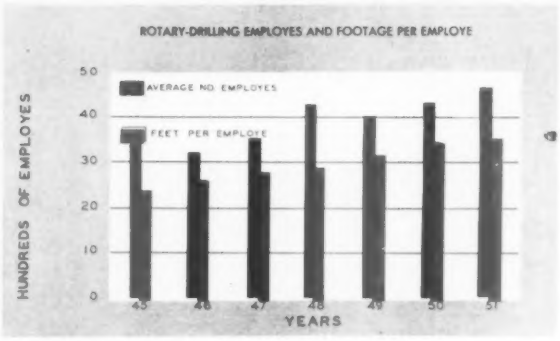
It looks as though wells to be drilled will soon hit 50,000 annually. Rotary tools will continue to drill most of them as shown by the accompanying data.

Year	No. wells	Rotary drilled	Cable tool
1944	25,524	16,519	9,005
1945	26,764	17,922	8,842
1946	29,729	20,668	9,061
1947	33,135	23,237	9,898
1948	39,629	29,502	10,127
1948	39,000	30,967	8,033
1950	43,242	35,261	7,981
1951	44,516	36,820	7,696

FOOTAGE PER EMPLOYE

Employes engaged in rotary drilling right now are well over the 50,000 mark. Back in 1945 there were some 33,418 employes in rotary drilling.

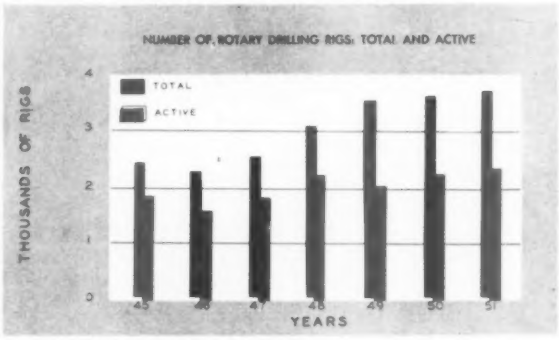
Year	Avg. employes	Ft. per man
1945	33,418	2,285
1946	31,115	2,637
1947	35,437	2,709
1948	42,434	2,768
1949	39,396	3,100
1950	42,356	3,388
1951	45,720	3,486



NUMBER OF ROTARY RIGS

Active rigs, of course, are those that are "working." Total rigs include those waiting for work, shut down for repairs, semiobsolete units, etc.

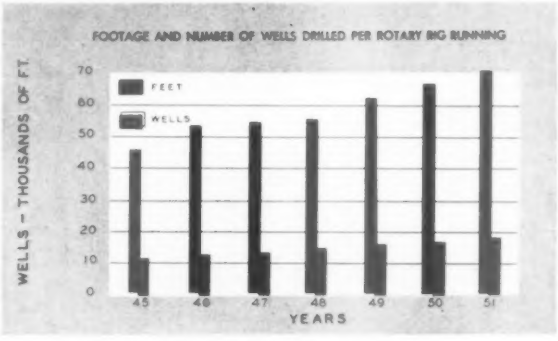
Year	Total rigs	Rigs active
1945	2,365	1,705
1946	2,165	1,562
1947	2,505	1,808
1948	3,000	2,165
1949	3,200	2,010
1950	3,300	2,161
1951	3,850	2,286



FOOTAGE PER RUNNING RIG

Each year the figures are going up. Right now the average rig probably cuts over 70,000 ft. of hole annually, drills 20-plus wells.

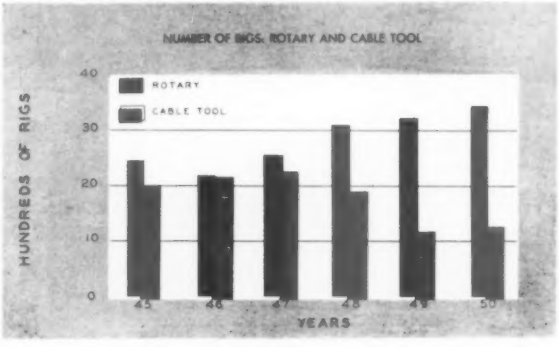
Year	Wells	Footage
1945	10.58	44,788
1946	12.91	52,528
1947	12.85	53,088
1948	13.70	54,256
1949	15.43	60,755
1950	16.33	66,414
1951	18.04	69,756



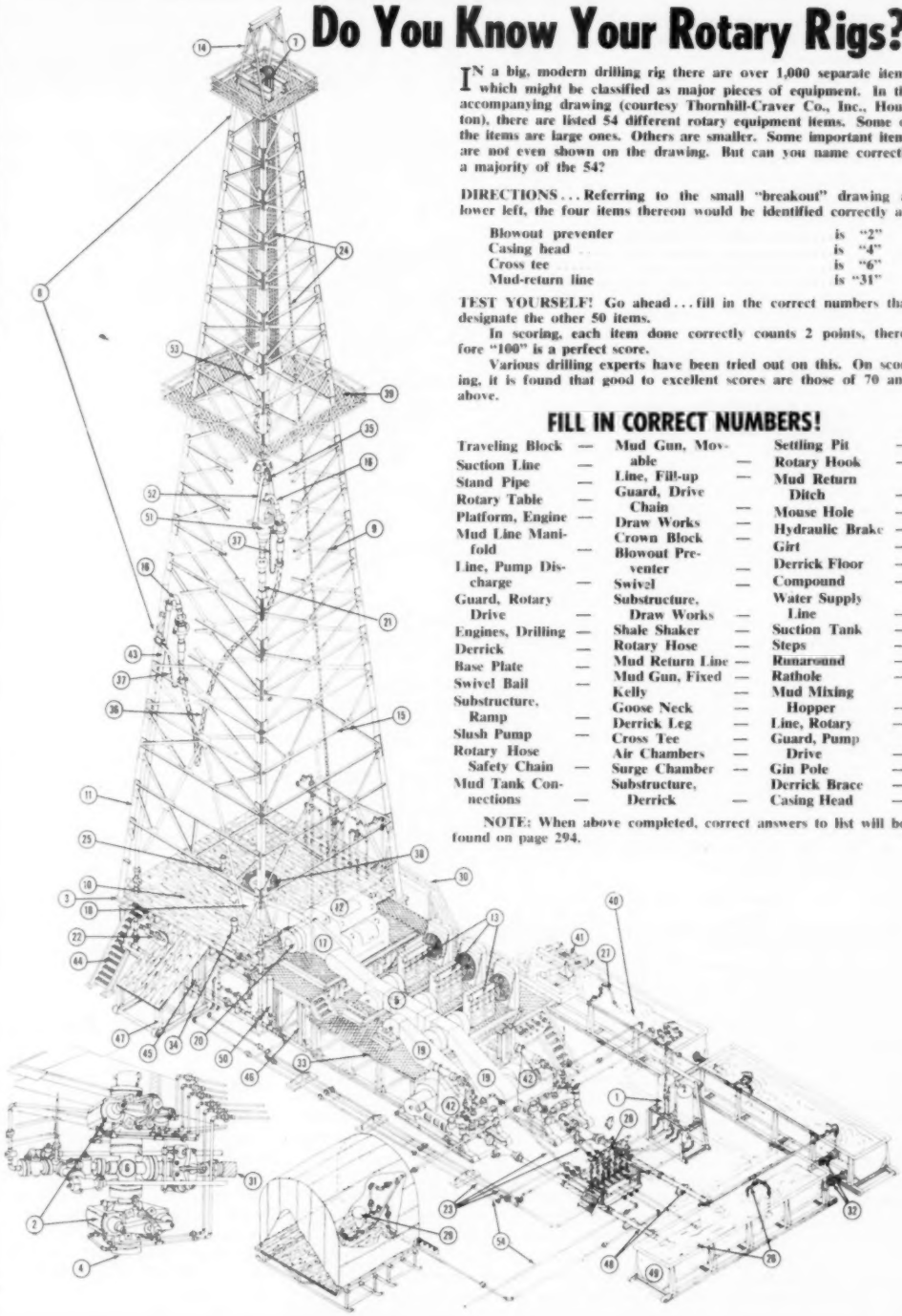
ROTARY AND CABLE

Total rotary rigs of all kinds that can be run are about at the 3,800-3,900 mark. Corresponding figure for cable tool outfits is approximately 1,500.

Year	Rotary rigs	Cable tool
1945	2,365	2,022
1946	2,165	2,188
1947	2,505	2,236
1948	3,000	1,950
1949	3,200	1,090
1950	3,300	1,400
1951	3,850	1,500



Do You Know Your Rotary Rigs?



IN a big, modern drilling rig there are over 1,000 separate items which might be classified as major pieces of equipment. In the accompanying drawing (courtesy Thornhill-Craver Co., Inc., Houston), there are listed 54 different rotary equipment items. Some of the items are large ones. Others are smaller. Some important items are not even shown on the drawing. But can you name correctly a majority of the 54?

DIRECTIONS... Referring to the small "breakout" drawing at lower left, the four items thereon would be identified correctly as:

Blowout preventer	is "2"
Casing head	is "4"
Cross tee	is "6"
Mud-return line	is "31"

TEST YOURSELF! Go ahead... fill in the correct numbers that designate the other 50 items.

In scoring, each item done correctly counts 2 points, therefore "100" is a perfect score.

Various drilling experts have been tried out on this. On scoring, it is found that good to excellent scores are those of 70 and above.

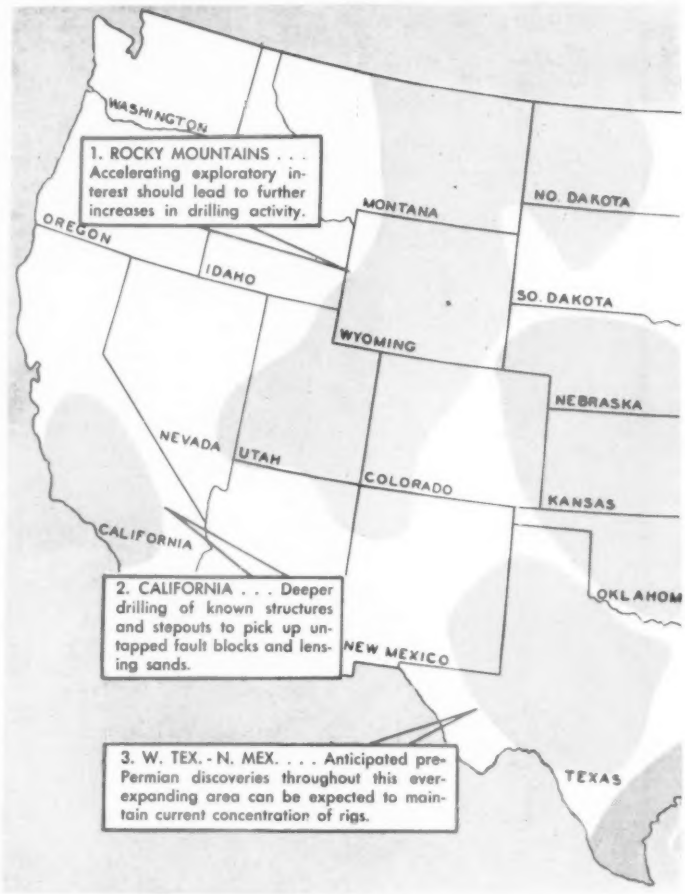
FILL IN CORRECT NUMBERS!

Traveling Block	—	Mud Gun, Movable	—	Settling Pit	—
Suction Line	—	Line, Fill-up	—	Rotary Hook	—
Stand Pipe	—	Guard, Drive Chain	—	Mud Return Ditch	—
Rotary Table	—	Draw Works	—	Mouse Hole	—
Platform, Engine	—	Crown Block	—	Hydraulic Brake	—
Mud Line Manifold	—	Blowout Preventer	—	Girt	—
Line, Pump Discharge	—	Swivel	—	Derrick Floor	—
Guard, Rotary Drive	—	Substructure, Draw Works	—	Compound	—
Engines, Drilling	—	Shale Shaker	—	Water Supply Line	—
Derrick	—	Rotary Hose	—	Suction Tank	—
Base Plate	—	Mud Return Line	—	Steps	—
Swivel Bail	—	Mud Gun, Fixed	—	Runaround	—
Substructure, Ramp	—	Kelly	—	Rathole	—
Slush Pump	—	Goose Neck	—	Mud Mixing Hopper	—
Rotary Hose Safety Chain	—	Derrick Leg	—	Line, Rotary	—
Mud Tank Connections	—	Cross Tee	—	Guard, Pump Drive	—
		Air Chambers	—	Gin Pole	—
		Surge Chamber	—	Derrick Brace	—
		Substructure, Derrick	—	Casing Head	—

NOTE: When above completed, correct answers to list will be found on page 294.

Mr. Drilling Contractor Wants to Know . . .

What's the Quick Dope on


WASHINGTON
1. ROCKY MOUNTAINS . . . Accelerating exploratory interest should lead to further increases in drilling activity.
MONTANA
NO. DAKOTA
OREGON
IDAHO
SO. DAKOTA
WYOMING
NEBRASKA
NEVADA
UTAH
COLORADO
KANSAS
CALIFORNIA
2. CALIFORNIA . . . Deeper drilling of known structures and stepouts to pick up untapped fault blocks and lensing sands.
OKLAHOM
NEW MEXICO
3. W. TEX. - N. MEX. . . . Anticipated pre-Permian discoveries throughout this ever-expanding area can be expected to maintain current concentration of rigs.
TEXAS

. . . Find the answer on this Journal map

1. Rocky Mountains . . .

So far, this is a barely scratched area of accelerating activity. Primary area of interest is the Williston basin, but the intermontane basins of Wyoming and Colorado, Uinta basin of northeastern Utah, and San Juan basin of northwestern New Mexico will play substantial roles in future activity. Exploratory staffs of companies operating in Rocky Mountan areas are being rapidly expanded. Many new companies are moving in. This buildup of exploration activity promises more and more drilling.

Williston basin . . . Except at Beaver Lodge-Tioga in North Dakota, where development drilling is in high gear tapping the Madison at depths of 8,500 ft., the pool-well drilling of the past year's discoveries has been at a minimum. Lease situations make wildcatting imperative. As lease situations firm up, more development drilling can be expected in eastern Montana. Discoveries are expected around the eastern and southern edges of the basin where productive rocks might be found at depths as shallow as 3,000 ft.

2. California . . .

The search for new reserves in this area is not going unrewarded. The complex faulting conditions that exist off the flanks of known fields makes every well a wildcat. Deeper drilling within old fields and the finding of new fault blocks off the edges of old fields will keep California active for many years. The deeper possibilities on western side of the San Joaquin Valley are being actively explored.

3. West Texas, New Mexico . . .

Here is greatest concentration of drilling in world. Pre-Permian objectives, which now dominate exploratory and development drilling, may be as deep as 15,000 ft.

Midland basin's Spraberry development has begun to dwindle, but improved methods of recovery, if found effective, may spur drilling. Difficult-to-reach Ellenburger rocks are yielding some big fields. Pennsylvanian and Siluro-Devonian objectives are coming to play as important a part as they have on Eastern Shelf area.

Delaware basin offers one of the big hopes for this area to continue to remain tops in the world. Considered similar to the prolific Midland basin, this area to the southwest has recently had some encouragement in the form of large gas wells in widely separated areas—it is definitely an area to watch for future activity.

In southeastern New Mexico exploratory drilling to the north of the shelf-edge Permian fields is continuing to find Devonian production.

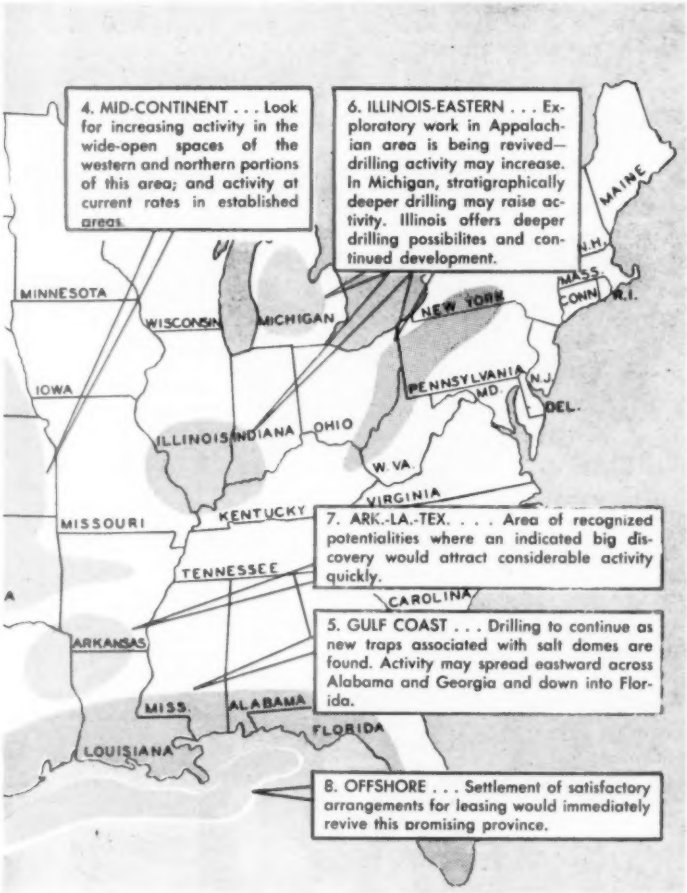
Central basin platform . . . Deeper drilling within predominantly Permian producing areas continue to develop significant reserves.

4. Mid-Continent . . .

High hopes for developing tremendous new reserves in this area are pinned to the northern part of the Texas Panhandle, the Oklahoma Panhandle, and far western Kansas—areas currently dominated by the largest gas field in the world. Drilling here in the immediate future will probably not exceed 7,500 ft. and much will be less than 5,000 ft.

Central Oklahoma . . . Deeper drilling

Future U.S. Drilling Areas?


4. MID-CONTINENT . . . Look for increasing activity in the wide-open spaces of the western and northern portions of this area; and activity at current rates in established areas.
6. ILLINOIS-EASTERN . . . Exploratory work in Appalachian area is being revived—drilling activity may increase. In Michigan, stratigraphically deeper drilling may raise activity. Illinois offers deeper drilling possibilites and continued development.
7. ARK.-LA.-TEX. . . . Area of recognized potentialities where an indicated big discovery would attract considerable activity quickly.
5. GULF COAST . . . Drilling to continue as new traps associated with salt domes are found. Activity may spread eastward across Alabama and Georgia and down into Florida.
8. OFFSHORE . . . Settlement of satisfactory arrangements for leasing would immediately revive this promising province.
MINNESOTA
WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
OHIO
MISSOURI
KENTUCKY
TENNESSEE
ARKANSAS
MISS.
ALABAMA
LOUISIANA
FLORIDA
CAROLINA
W. VA.
VIRGINIA
PENNSYLVANIA
NEW YORK
MD.
N.J.
DEL.
MASS.
CONN.
R.I.
N.H.
MAINE

. . . and in the accompanying paragraphs

continues to develop new reserves. Oil is being found in deeper rocks below old producing fields and off the flanks of producing structures. Current successes point to continued activity of substantial proportions throughout this area.

McAlester Coal basin is seeing considerable leasing activity, but just when drilling will begin in earnest can only be a guess.

Central Kansas uplift . . . Drilling for small oil fields can be expected at about the same rate with an increase to the west of the uplift.

Julesburg basin, though considered Rocky Mountain territory, is Mid-Continent type of accumulation and drilling conditions. Here drilling activity continues to gain momentum. More and more small fields are being found. Activity may spread southward into southeastern Colorado if current high exploratory interest in that area comes up with an oil field.

5. Gulf Coast . . .

This big producing area continues its high rate of drilling activity. Drilling primarily concentrated on salt-dome-provoked structures. New reserves are constantly being found by stepping back from these salt domes, finding new fault traps.

Interest recently extended eastward to include Florida. This has been due to a discovery in Alabama farther south and east of any production except Florida's lone oil field. This eastern area is rank wildcat country, but it is also a country of promise. A strike in Florida or Georgia would call for a rush of rigs to the area.

6. Illinois Eastern . . .

An area of continued probing for small fields. Depths average about 3,500 ft. Area might become more active with discovery of deep production out in the Illinois basin. Such drilling would involve depths to 8,000 ft.

Michigan basin is showing increased interest due to discovery of valuable gas in rocks stratigraphically deeper than have been drilled in past. This activity, now on rims of the basin, could conceivably move basinward as time goes on.

Appalachian . . . Western Pennsylvania, West Virginia, southwestern New York, eastern Kentucky, and western Ohio make up the oldest producing provinces in the country. Routine drilling and sporadic wildcatting going on at present. Future potentialities of the area are recognized and being studied so that once again the area might see an increase of drilling activity.

7. Ark.-La.-Texas . . .

Drilling activity is not high at present. Situation could change overnight with discovery of a significant new field.

This area, which contains the biggest oil field in the country, still has hope of finding more big fields. Hope is currently pinned on the deeper rocks and around the known salt domes which have not been thoroughly tested.

8. Offshore . . .

An area of great promise. Actual drilling conditions, apart from the managing of over-water drilling equipment, is similar to Gulf Coast—fast drilling. Exploratory work, once the area has been opened up to the satisfaction of oil companies, will proceed much as on land immediately to the north.

THE OIL AND GAS JOURNAL'S THIRD

Annual Census of the Rotary-Drilling Industry

NEARLY 3 million dollars a day is a big item and that figure represents what the United States oil industry spends to drill its wells.

More than 90 per cent of the drilling is done by contractors, the annual census of The Oil and Gas Journal reveals.

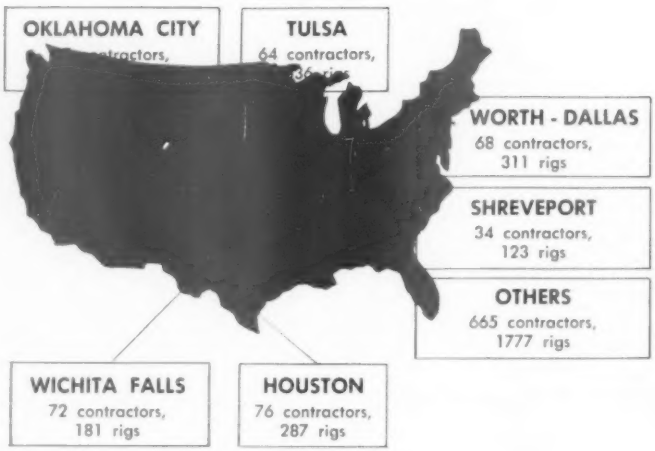
More than a thousand drilling contractors are doing business every day in the American oil fields. They own a total of 3,382 rigs, or 3.3 rigs per contractor. That means that there are hundreds upon hundreds of small contractors in the business.

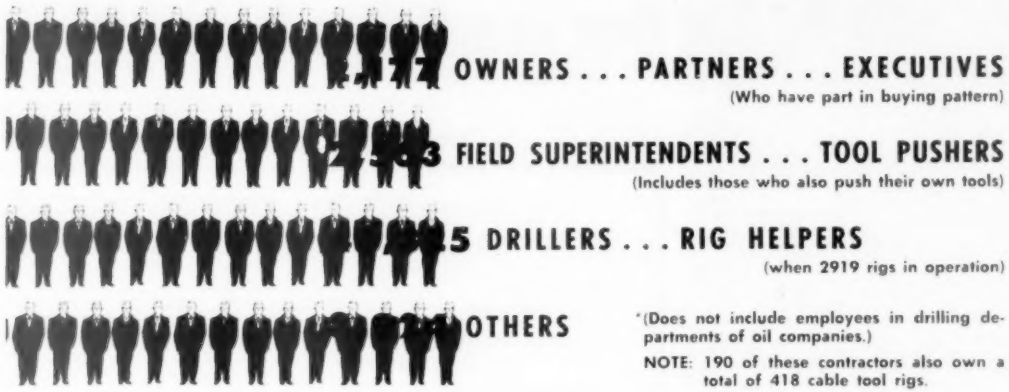
Manpower Requirements

It takes 15.7 drillers and tool pushers to operate the average rotary rig. Multiply this figure by the 2,919 rigs in operation at the time of the survey, and the product is 45,888 field personnel. Break this number down into 43,325 drillers and rig helpers and 2,563 men who push tools and direct operations as field superintendents. The Journal didn't get the figures this way—it actually counted them individually on the payrolls—but the preceding gives an idea of the count.

The writing of contracts, the payroll checks, the drilling records, and a considerable part of the buying problems are centered in the district and main offices of the contractors. This group comprises 2,177 owners, partners, and executives. In addition, there are 8,924 office workers and others gainfully employed by the contracting industry. In the 1952 count by The Oil and Gas Journal, this adds up to a total of 55,989.

Where Is the Concentration of Home Office Control for Rigs Owned?




OWNERS . . . PARTNERS . . . EXECUTIVES
(Who have part in buying pattern)
FIELD SUPERINTENDENTS . . . TOOL PUSHERS
(Includes those who also push their own tools)
DRILLERS . . . RIG HELPERS
(when 2919 rigs in operation)
OTHERS

*(Does not include employees in drilling departments of oil companies.)

NOTE: 190 of these contractors also own a total of 418 cable tool rigs.

Operating nerve centers . . . From the metropolitan cities in the southwestern oil fields are directed the far-flung operations of 1,026 drilling contractors. From Houston, 76 contractors direct 287 rigs operating principally along the Gulf Coast from Florida to Mexico. In Wichita Falls are clustered 72 contractors directing 181 rigs sprawling principally in North Texas, the Texas Panhandle, and southern Oklahoma. From Dallas and Fort Worth, 68 contractors direct 311 rigs operating in principal southwestern fields.

Tulsa's 64 drilling contractors operate 536 rigs in southwestern and Rocky Mountain fields. Oklahoma City has 47 contractors directing 167 rigs in the Mid-Continent. Shreveport's 34 contractors supervise work in the Ark-La-Tex area with 125 rigs. Los Angeles is the important nerve center serving southern California.

The Journal census also revealed that 84 per cent of the drilling contractors own and operate oil and gas wells. More than half of these contractor-producers have producing operations which are more important than their contract drilling activities.

Where Were the 2,563 Superintendents and Tool Pushers Located Who Were Supervising 2,919 Rigs at Time this Census Was Made?

contractors also own and operate oil and gas wells

of contractors have no oil or gas wells

862 contractors out of 1,026 total, also own and produce oil and gas wells; for over half of these, their producing activities are more important than their contract drilling activities. Of the 164 remaining contractors, 68% are endeavoring to develop production.

rotary rigs operated by contractors

rotary rigs operated by oil companies

About 19% of rotary drilling done by oil companies operating their own tools (this varies somewhat in different parts of country). As deeper drilling trend continues, oil companies assume a greater and greater share of drilling risks, hence are increasingly interested in type of equipment contractors use for them.

How Do You Rate as a Drilling Supervisor?

Directions to Test Yourself

THIS is a sample test for self-appraisal for oil supervisory workers. It should not be regarded as scientific or exact but rather simply a check list of desirable traits and characteristics found in most (but not all) supervisors.

- Besides each trait is a line. At various points under the line are guide phrases. For example, the guide phrases under the trait "Likes people" range from "positive friendly interest" to "polite and pleasant," to "indifferent toleration," to "sour, active dislike." Make a check mark on the line exactly where it ought to be.

- Rate yourself. Then ask a friend to get anonymous ratings on you from several people who know you well and whose opinions you respect. Do NOT ask who gave you good or bad ratings. You are interested only in the composite picture of how you appear to others. Then compare the score given you by others with that which you give yourself.

- The results will probably startle you! On many points you will be pleasantly surprised. On others your embarrassment will know no bounds.

- This "check chart" presented by The Oil and Gas Journal from "How to Organize and Manage a Small Business" by Nelms Black (367 pp., $3.75) by special permission from the publisher, University of Oklahoma Press, Norman, Okla.

HERE'S A 38-POINT "PERSONAL

1. Personality	outstanding	good	so-so	poor
2. Physical make-up	strikingly good	average	not good	very poor
3. Initiative	real go-getter	self-starter	all talk no action	sack artist
4. Ability	keenly expert	good and thorough	fair	knucklehead
5. Knowledge	smart as a whip	generally good	about average	sub-stupid
6. Dependability	always on the ball	tries hard	promises more than he can do	screw-ball
7. Responsibility	eats it up	doesn't mind	avoids it when possible	shirks it
8. Leadership	tops in inspiration	order giver	stupid driver	hopelessly weak
9. Reaction to criticism	welcomes and uses it	takes it but it hurts	asks it then resents it	can't stand any
10. Judgment	uncannily accurate	right more than wrong	fair	hopeless self-kidder
11. Confidence	inspires it	quietly confident	a worrier	Casper Milquetoast
12. Sincerity	fearless square-shooter	on the level	fairly (if safe)	not to be trusted
13. Competence	quiet, impressive	has the word	cocky and questionable	incompetent
14. Headwork	sharp and accurate	good and dependable	fair to middlin'	Dilbert
15. Decision	fast and right	good and careful	goes off half-cocked	hesitant and fearful
16. Courage	fearless, no buck passer	good but cautious	average	timid
17. Determination	confident persistence	good singleness of purpose	average will power	easily licked
18. Realism	utter realist	feet on ground	hopes instead of thinks	day-dreamer
19. Culture	refinement and balance	college type	average American	back-woods
20. Organizer	genius	very able	good	poor
21. Manager	leader	good boss	one of the boys	policeman
22. Humor	fine sense of humor	likes good joke	tolerates a joke	sourpuss

. . . In the rough-and-tumble, day-and-night, extremely competitive business of rotary drilling, supervisory drilling personnel must (1) get along *well* with their employes; (2) have the *best* relationships with their employers. To accomplish this, you should rate an average-to-good score.

ANALYSIS" FOR SUPERVISORY PERSONNEL

23. Mixer	attracts and wins friends	good mixer	reserved	avoids people
24. Concentration	nothing interrupts it	good under favorable conditions	fair for a limited time	squirrel cage
25. Sense of justice	impartial but human	slightly prejudiced	disinterested	highly warped
26. Temper	controlled	even	hot but human	uncontrollable
27. Talker	ready, fluent fascinating	good, interesting	average	poor
28. Consistency	very consistent	reasonably consistent	variable	unpredictable
29. Salesmanship	sincere, persuasive, convincing	competent service order taker	bird dog	square peg
30. Poise	excellent under fire	generally good	fair but lacking in pinches	poor
31. Shrewdness	never misses a trick	gets along	taken in once in awhile	fall guy
32. Human warmth	friendly, understanding, sympathetic	kindly but reserved	indifferent	truculent
33. Physical energy	high and constant	above average	fair	below average
34. Enthusiasm	sustained and infectious	ample but not consistent	occasional	wet blanket
35. Ambition	high new aims clearly in mind	occasionally plans for future	rarely thinks of future	rarely thinks
36. Attitude in emergency	calm, clear, in good spirits	grim, thinks fast	worried, excited	dopes off through sheer excitement
37. Accessibility	easy to know and like	a bit high-hat and reserved	hard nose	completely self-centered
38. Likes people	positive, friendly interest	pleasant, polite	indifferent toleration	sour, active dislike

What Price Drilling Contracts?

This tabulation by The Oil and Gas Journal is made from actual contracts made during the past 12 months.

DRILLING-CONTRACT prices and provisions command major interest to the drilling contractor. The profitability of a given contract rests on many intricate factors and a single item, if ignored, can change economics from the black side to the red side of the ledger.

To stay in business the contractor must be informed constantly of the detailed drilling conditions that characterize each drilling province including such items as:

- **SURFACE PROBLEMS:** Character of terrain—mountainous areas, swampy or lake areas, bayou problems, availability of roads, load-sustaining ability of roads, types of water crossings, and the like.
- **PENETRATION PROBLEMS:** High-angle folds, abnormal pressure zones, zones of lost circulation, high-pressure water-flow zones.
- **MUD PROBLEMS:** Mud programs employed in nearby wells to maintain good wall cake in drilling below surface pipe; additives to control high-pressure gas zones, evaporate zones, and the like.
- **CASING PROGRAMS:** Casing and cementing practices, special conditions requiring full-hole cementing, use of extra strings to shut off shallow water zones.

In addition to these conditions, the contractor must be informed on prevailing field prices including footage prices and day-work rates. To aid the contractor, The Oil and Gas Journal has expanded its annual feature on "Rotary Drilling Contract Prices" to

PERMIAN BASIN

Field and state (county)—	Footage price	Contract depth (ft.)	Day work rate	Total footage days	Days on day work
WEST TEXAS:					
Anton-Irish (Hale)	5.25	5,800	525	26	1
Cogdell (Kent)	5.75	7,100	675	39	4
Corrigan, Southeast (Terry)	11.00	11,000	900/1,000	85	39
Diamond M (Scurry)	5.75	7,100	675	39	4
Ft. Chadbourne (Runnels)	5.00	5,500	575	30	2
Goldsmith-Clear Fork	5.50	5,800/6,400	675	29	8
Kelly-Snyder (Scurry)	5.75	7,100	675	39	4
Landon	3.75	5,100	500	15	4
McElroy-Ellenburger	12.00-12.50	12,250	750/1,000	92	15
Midland Farms (Andrews)	3.00	4,800	575	9	5
Slaughter	4.00	5,100	575	15	4
Spraberry Trend	6.00	7,600	675	32	5
Wellman (Terry)	8.50	10,000	900	60	7
SOUTHEAST NEW MEXICO:					
Fowler Unit (Lea)	8.00	7,500	800	45	2
North Lovington (Lea)	8.75	11,000	950	142	80
South Lovington (Lea)	8.75	9,000	850	55	7
Denton (Lea)	8.75	9,000	950	60	120

GULF COAST REGION

SOUTH TEXAS:					
Beaumont, West (Jefferson)	3.75	6,000	650	17	5
Clinton (Harris)	3.25	6,800	700	15	8
Fulton Beach (Nueces) (barge)	6.50	7,300	1,500	18	12
Hull (Liberty)	5.00	9,400	750	26	2
Minoak (Bee)	4.50	8,500	850	35	20
New Ulm (Austin)	4.50	10,500	725	8	5
Riverside, East (Nueces)	3.10	5,500	500	10	5
Spindletop (Jefferson)	3.75	6,000	650	15	5
SOUTH LOUISIANA:					
Bayou Blue	4.50	6,800	650	24	6
Lowry	6.25	9,500	1,225	18	
Lake Long (Bourg), Terrebonne Par.	5.50	11,700	900/1,100		
Plumb Bob, St. Martin Parish	6.00	10,000	950	49	53
Romere Pass, Plaquemines Parish	2.25-6.00	10,500	985	21	13

MID-CONTINENT

OKLAHOMA:					
Golden Trend					
Elmore, Northeast (Garvin)	5.00	7,050	650/550	35	17
Katie (Garvin)	5.35	7,200	700/600	44	14
			750/650		
New Hope, Southeast (Garvin)	5.50	7,500	650/550	60	22
Panther Creek, Southwest (Garvin)	5.50	7,850	650/550	48	10
Seminole Region					
Bowlegs (Seminole)	3.85	4,200	480/360	23	76
Keokuk (Seminole)	3.25	3,450	500	11	8
Macomb, Southeast (Pottawatomie)	4.00	4,600	500	28	4
Searight (Seminole)	3.25	2,600	650/500	18	24
Springer Trend					
Fox-Deep (Carter)	5.75	6,000	625		
Fox-Graham (Carter)	5.50	5,400	550/650	44	20
Hewitt (Carter)	6.25	6,100	600/550	90	45
Sholem-Alechem (Stephens)	5.25	5,200	625	15	3
Velma, East (Stephens)	6.20	6,000	675	35	2
Southwest Oklahoma					
Elk City (Beckham-Washita)	6.75	10,500	850/750	51	3
Gotebo, Northeast (Kiowa)		5,500	650		
Roger Mills County	9.00	10,000	950	60	90
Other Areas					
Ceres (Noble)	3.85	4,300	525		
Chandler, South (Lincoln)	4.00	4,100	650		
Fox-Shallow	5.00	4,400	525	25	2
Greenough (Beaver)	7.50	6,350	750/650	51	6
Rich Valley, Southeast (Grant)	7.50	5,875	600/550	53	11
Southern Oklahoma					
Township 2n-8w	4.75	4,000	500		
Township 2n-8w	6.50	7,600	575/675		
Township 2s-4w	4.00	4,400	575		
Township 2s-5w	4.75	4,300	500		
Township 2s-5w	4.75	2,700	500		
KANSAS:					
Ogallah (Trego)	3.00	3,900	500	10	2
Hugoton gas field	3.00	2,800	500	8	1
Rooks County	3.00	3,800	450		
North Star (Stafford)	3.25	4,000	450		
Adams Ranch (Meade)	7.50	6,500	700/600	44	15
NORTH TEXAS:					
North Knox City	4.25	4,300	500	22	6

ARK.-LA.-TEX.

Field and state (county)—	Footage price	Contract depth (ft.)	Day work rate	Total footage days	Days on day work
EAST TEXAS:					
East Texas field	1.35	3,600	450	5	0
Woodlawn (Harrison)	4.50	6,700	675	26	6
NORTH LOUISIANA:					
North Shongaloo	4.25	5,900	600	24	5
Big Creek	3.00	2,900	500	9	2
ARKANSAS:					
Buckner (Columbia)	4.00	5,500	575/525	21	12
Fouke (Miller)	3.25	4,500	500/450	14	3
Schuler, East (Union)	5.25	7,800	650	47	8

ILLINOIS BASIN

ILLINOIS:					
Bald Knob	3.50-4.00	2,750	400/500	18	17
Cantrell, North	3.75	3,300	400	18	15
Claypole Hills	3.75	2,350	400	10	10
Dale-Hoodville	3.75	3,200	400	8	15
Dixie	3.75	2,800	400	15	15
Ellery, West	3.75	3,150	400	13	15
Fairbanks	3.75	2,300	360	12	3
Greenbrier, North	4.00	2,650	400	13	12
Henderson, South	4.00	2,800	400	8	9
Herman, East	4.25	1,200	150 CT	25	16
Hitesville Consol.	4.00	2,750	400	17	8
Inman, East	3.75	2,425	400	11	21
Morganfield, South	3.75	2,400	400	14	25
Louden	3.00	1,600	360	3	5
Poole Consol.	4.00	2,750	400/500	21	29
Poole, West	3.90	3,000	400	13	23
Robards Consol.	4.00	2,700	400	17	10
Roland	3.75	2,625	400	14	8
Spencer	3.90	2,950	400	17	12
Township 4s-9w	3.65	3,600	400		
Township 3n-4w	4.00	2,250	500		
INDIANA:					
Co-Ord. N-22	3.75	2,300	360		
Township 6s-7w	3.50	1,000	360		
KENTUCKY:					
Co-Ord. "O-26"	3.65	2,000	360		

ROCKY MOUNTAINS

MONTANA:					
East Poplar	(*)	9,000	925		
NEW MEXICO:					
San Juan Basin					
Blanco-Mesaverde	6.00	5,100	600	18	2
UTAH:					
Uinta Basin					
Duchesne	(*)	9,000	875	240	80

*All work on day-work rate.

WYOMING:					
Grass Creek	6.00	3,100	550	12	5
Beaver Creek-Shallow	3.25	4,100	625	7	6
WESTERN CANADA:					
Alberta					
South of Edmonton	5.75	5,200-5,600	744	30-35	

CALIFORNIA

SAN JOAQUIN VALLEY:					
Edison area	6.75	6,400	900	27	3
Russell Ranch	6.25	3,500	800	13	2
South Cuyama	6.25	4,500	800	18	2
COASTAL CALIFORNIA:					
Cat Canyon, deep	7.00	5,600	850	25	5
Cat Canyon, shallow	4.50	3,000	800	12	5
San Ardo	4.50	2,100	775	6	2
Ventura, D-6 and D-7 zones	15.00	11,500	1,100	75	8
Ventura, D-5 zone	10.50	6,700	900	40	5
LOS ANGELES REGION:					
Brea-Olinda	8.00	5,300	900	30	3
Del Valle	10.00	6,750	950	41	9
Long Beach	5.75	3,500	825	18	2
Placerita Canyon	4.50	2,000	800	6	2
Wilmington	4.75	3,800	900	22	7

include discussion of some of the contractural provisions written for special conditions in certain areas as outlined below by provinces.

South Louisiana

Contracts written for bay drilling contain more variations than possibly any other type of drilling contract. For example, in Delta Farms field in South Louisiana, operator furnishes fuel, water, boats, and barges. In this field, day-work contract provisions are broken down in depth segments. For example, from zero to 10,500 ft., day-work rate is $985 per day, while for the interval from 10,500 to 13,500 ft., the day-work rate changes to $1,035.

An unusual contract price arrangement occurs in Romere Pass field. Footage prices are $2.25 per foot from surface to 9,000 ft. This section is drilled fast through the use of jet drill bits. However, for the interval from 9,000 to 10,500 ft., in which the reservoirs are found, the footage rate increases to $6.00. Here the operator furnishes everything including boats and barges.

On the Lowry project in Cameron Parish, the operator furnishes tugs and barges while the contractor furnishes fuel and water. Here there is a depth clause in the day-work rate, i.e., from zero to 10,000 ft., $1,150 without drill pipe and $1,225 where drill pipe is furnished by contractor. However, for the interval from 10,000 to 11,000 ft. the day-work rate increases to $1,200 without drill pipe and $1,275 where drill pipe is furnished by contractor. Drilling in this area is done with barge-mounted diesel-electric drilling rigs.

In Plumb Bob field of St. Martin Parish, the operator pays the contractor $1,300 per month for the rental of two cargo barges furnished by contractor. Contractor furnishes fuel, water, and derrick, while operator furnishes boats, barges, and mud. Here footage rate is $6.00 from surface to 10,000 ft., while day-work rate is $900 plus rental cost of 1½ cents per foot in straight hole and 2 cents per foot for drill-pipe rental in deviated hole. Obviously, the ½-cent differential for drill-pipe rental offsets the hazards caused by running drill pipe in deviated hole.

Texas Fields

Gulf Coast . . . One of the highest footage rates paid in the Gulf Coast today is in Hull field of Liberty County, in development of 9,400-ft. faulted segments on the flanks of this piercement-type salt dome. This operation ordinarily requires 26 days. Day-work rate is $750 per day for 2 days usual

completion operation. An unusual day-work rate of $1,500 is provided for in several barge-drilling contracts written for Fulton Beach field of Nueces County. Ordinarily, 12 days are required for day work. This high day-work rate for "over water" is three times that of on-land rates in nearby areas. For example, day-work rate in Riverside East field of Nueces County is $500.

West Texas . . . One major oil company operating in Midland Farms field in Andrews County, West Texas, pays $3.00 per foot on a 4,800-ft. San Andres contract, which ordinarily requires 9 days. One of the highest footage rates paid in West Texas is in McElroy-Ellenburger field of Upton County where $12.00 to $12.50 per foot is paid on 12,250-ft. Ellenburger contracts. Normally, 92 days are required to reach this depth.

East Texas . . . Footage rates of only $1.35 per foot are paid for the light rigs on routine inside drilling in the vast East Texas oil field on 3,600-ft. operations. Modern rigs cut this depth well in only 5 days. In contrast to this routine digging is Woodlawn gas field in nearby Harrison County near the Louisiana border. Footage rates are $4.50 per foot an a 6,700-ft. contract requiring 26 days to drill. Other areas run higher.

California Fields

Los Angeles region . . . Footage rates of $4.50 per foot are written on shallow 2,000-ft. contracts in Placerita Canyon field on fast, easy digging with only 6 days required to contract depth. On the north end, in Del Valle field, footage rate prices of $10 per foot are written on 6,750-ft. wells which require 41 days.

Coastal California . . . Wells drilled in San Ardo field usually require only 6 days to reach 2,100 ft. Footage prices are $4.50 per foot. In contrast to this easy digging is the 11,500-ft. contracts which require 75 days to drill in the Ventura D-6 and D-7 zones. On 6,700-ft. contracts requiring 40 days in the D-5 zone, the going footage rate is $10.50.

San Joaquin Valley . . . Footage prices paid in development operations in the San Joaquin Valley reflect a narrow range. In South Cuyama and Russell Ranch, these are $6.25 per foot on 4,500 and 3,500-ft. contracts, respectively. Deeper operations, such as the Edison area, are written for $6.25 on a 6,400-ft. project requiring 27 days to drill.

Illinois Basin

Illinois . . . Going prices for developmental work in the Mississippian objective are in the range of from $3.00 to $4.00 per foot. For example, in the 1,600-ft. zone in Louden field, footage rates are $3.00 per foot and only 3 days are required to reach contract depth. On the other hand, in Spencer field on a 2,950-ft. contract requiring 17 days to drill, the footage rate is $3.90.

Indiana . . . Shallow 1,000-ft. wells in the Southwest Indiana fields are written on $3.50 per foot rates while 2,300-ft. contracts are written on a slightly higher price of $3.75.

Kentucky . . . The going footage price for shallow 2,000-ft. Kentucky development wells is $3.65. This is intermediate to both Indiana and Illinois current prices.

Oklahoma

One of the lowest prices paid in Oklahoma—but for cable tools—for footage prices is in the Bowden area, Creek County. Footage price paid is $1.85 for a Pennsylvanian sand well, which ordinarily requires 14 days of drilling time. In this field, the day-work rate is divided into $195 per day for working time and $97.50 per day for time while waiting, or standby.

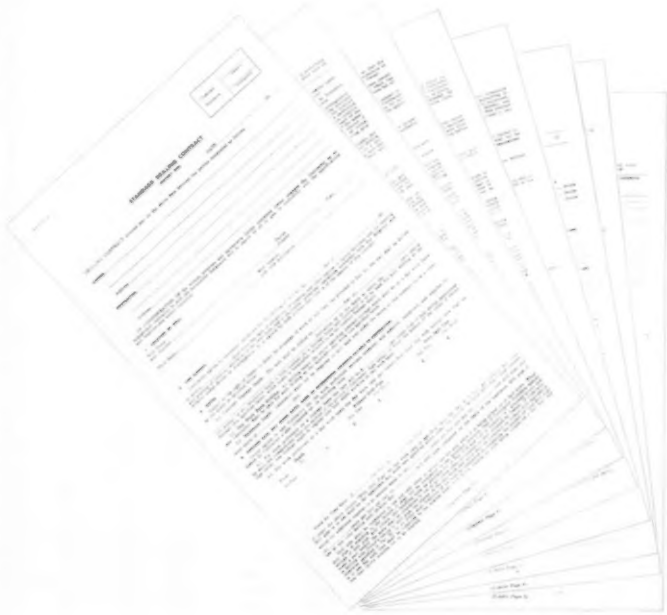
The other extreme in footage price rates in Oklahoma is in Roger Mills County where $9.00 per foot was paid on a 10,000-ft. exploratory test. This required 60 days of drilling time to reach contract depth.

Western Kansas

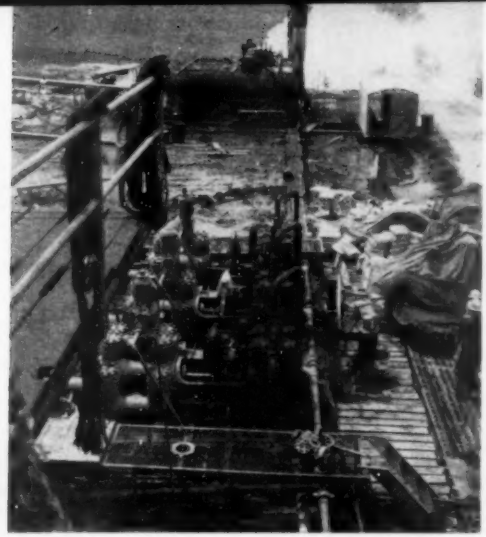
Possibly the most uniform contract prices in effect at the present time prevail for developmental operations in the Central Kansas uplift. Footage prices for 3,800 to 4,000-ft. Arbuckle limestone objective averages $3.00 per foot. Day-work rate for the same area ranges between $450 to $500 per day.

In Trego County, in farwestern Kansas, 10 days are required to reach contract depth and 2 days for day work.

MR. DRILLING CONTRACTOR! — A.A.O.D.C. directors have agreed on improved new form. Over 7,500 copies of these contract blanks now ordered. Get yours from Dallas office.



1 One of Housh Drilling Co.'s (Houston) rigs, showing in foreground portable loading rack.



2 View of Housh Drilling Co.'s unitized slush pumps, steam pipe, and boiler locations.

DRILLING-EQUIPMENT REPORT . . .

How Hole Is Made on Gulf Coast

by Walter F. Rose
Gulf Coast District Editor

THE Gulf Coast, which witnessed the birth of rotary drilling at Spindletop at the turn of the century, is still a very active drilling area. Today more than 500 active rotary rigs are in operation at all times, and drilling contractors as well as company crews are busy finding new production and reworking older proven areas.

The interested observer traveling the highways and byways of the coastal plains, the corduroy roads of the swamps and marshes, and the boat and air routes to the offshore locations will see all kinds of drilling equipment. Junk rigs with makeshift gimmicks will be alongside modern rigs of such complexity that the driller feels the need of a college education. Steam rigs will be found as well as power rigs, drilling shallow holes or deep holes as the case might be.

To give a picture of current drilling practice in the Gulf Coast, this article will describe equipment being used by two drilling contractors who have been leaders in proposing and adopting innovations intended to improve drilling operations at a reduced cost. One of these contractors, Housh Drilling Co., of Houston, has steam rigs which have been unitized to facilitate transport of rig between locations, rigging up and tearing down, and to facilitate replacement and interchange of parts. The other contractor, Buzzini Drilling Co., of San Antonio, has power rigs of unusual design, as will be described.

Unitized Steam Rigs of Housh Drilling

While steam-rig drilling is on the decline in the country at large, it is still an important factor in the Gulf Coast. This is because of the relative cheapness of gas for fuel and because of the abundance of water supply for steam generation.

The several inherent advantages of steam rigs, such as the ease with which they are maintained and the fact that steam engines develop maximum torque when needed (viz, at the point of stalling) speak for themselves. However, Housh Drilling Co. as well as other contractors and operators having steam rigs have realized that special effort must be made to keep pace with the increasing efficiencies and economies being engineered into power rigs. The drilling business is a competitive one, and if steam rigs are to be used they must be kept modern.

Housh now has four of its eight rigs completely unitized along the lines described more completely in a previous article *(See The Oil and Gas Journal, September 22, 1949, page 163)*. At the time this earlier article was written Housh was still experimenting with unitized rig design on one rig. In the intervening years this unitizing has been further standardized as more rigs have been converted, and other operators have contributed new ideas through their engineering research *(The Oil and Gas Journal, June 16, 1952, page 232)*.

Currently Housh has one of its unitized rigs operating near Texas City, as illustrated in the accompanying photographs. Fig. 1 and 2 are general views illustrating layout features, and show in one case the portable loading rack, and in the other case, the unitized slush pumps, steam piping, and boiler location.

Fig. 3 shows the misaligning couplings which provide for connection of steam from the boilers to the live steam line on the left. This arrangement allows some tolerance in selection of the site for the boilers. The steam line on the right carries the exhaust steam in part to the boiler drafts and in part to the exhaust vent. As will be noticed, this unitized piping has a catwalk covering. The catwalk and piping, shown in Fig. 3, go to the boiler feed-pump skid.

3 "Misaligning" couplings connect steam line to boiler.

Fig. 4 is a detail shot of the coupling arrangement which joins sections of the unitized piping. This design facilitates replacement, and adds to the portability of the equipment. The large-diameter lines on the outside are the live and exhaust steam lines; the smaller-diameter inside lines carry high-pressure water to the blowout preventers and low-pressure water to the derrick floor.

Fig. 5 shows the unitized piping and coupling joints in the vicinity of the slush pumps. To the right, winch-line control of the mud pump intakes is to be noted.

Fig. 6 illustrates one novel feature in the unitized piping arrangement. The line angling up to the derrick floor at about 45° carries mud from the slush pumps. As pictured in Fig. 6, the derrick-floor level is about 17 ft. high, but in case the derrick floor were lower (such as 13 ft. high) all that would be required would be reversing the lower unit section of this line and coupling it so the short instead of the long end would be angling up. In the foreground of Fig. 6 are some portable road sections which are being used to bridge a drainage ditch.

All in all, the type of unitized steam rig used by Housh is intended add economy to steam drilling by minimizing rigging-up costs, allowing for replacement and interchange of parts, and by facilitating transport between locations. In general, this unitizing involves standardizing on rig layout, and providing for easy connection between the separate unit parts. In addition, the larger unit parts are skid mounted for easy transport, and carryalls are provided for smaller unit parts.

4 How sections of the unitized piping are neatly coupled up.

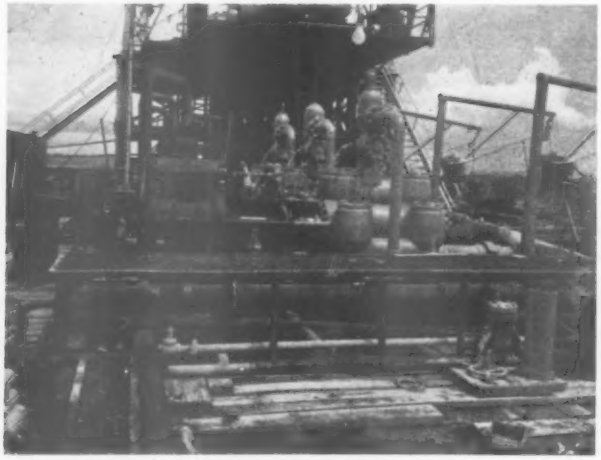
Power Rigs of Buzzini Drilling Co.

The great advantage of the power rig is its portability, and the fact that it can be used without dependence on water supply. Buzzini Drilling Co. has three rigs arranged as shown in the accompanying pictures to achieve added economy and efficiency in operation.

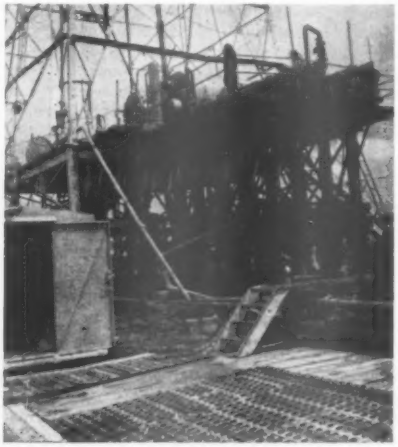
Fig. 7 is an over-all picture of one of the Buzzini rigs on a town-lot location in McAllen, Tex., and shows the relative size of this more than 10,000-ft. rig.

The rig has a Wilson Giant Torcair remote-control draw works powered by two Buda Model MOS-1290 engines with Torcon 19K torque converters. These two engines are also compounded to run the mud pump. A third model MOS-1290 engine with the same Torcon converter and Allison Torqumatic transmission is used to drive the rotary. On this same rig there is also an HP-326 and an L-525 engine on the utility unit.

In addition to the lightweight, high-speed, Model MOS-1290 engines being equipped with torque converters, the radiators for the engines are mounted on top rather than at the front end. This is illustrated in Fig. 8. A pusher-type fan blows the air up through the radiator for very efficient cooling. The top-mounted radiators cut down the over-all width of the draw works and engine combination so that it can be



5 Over-all shot of mud pumps, showing unitized lines, steel grating walkways, and at right, winch line control of mud intakes.



6 Mud line goes up at 45°. Note steel mats (portable road section units).

EMULSION BREAKER TEST REPORT

Or How To Do a Better Treating Job with 84% Less Chemical

GIVEN below is as unbiased a field test of emulsion-breaker performance as it is believed possible to secure. All production factors (except the quantities of chemicals used, and first-test circulation and recycling) were kept uniform throughout. Each entry indicates one day's production; the tests following one another chronologically on normal production schedules.

These tests were made to determine the most efficient and economical emulsion-breaker treatment *for the producer.* Neither Visco nor any competitive manufacturer or service organization supervised the tests; and no changes in the respective emulsion-breaker formulas or dosages were made during the trial periods after initially-recommended dosages by field service representatives.

Dollar-wise, without consideration of time and labor savings, Visco cost was *$0.99 per 100 barrels less . . . over 6 times the amount of dry oil was produced per gallon of Visco . . . and no circulating or recycling was necessary with Visco.*

FIRST TEST RUN

TEST DAY	OIL PRODUCED, BARRELS	GRAVITY	% B. S. & W.	AVERAGE CHEMICAL INJECTED	REMARKS
1	165.35	31.2	0.2	1 gallon	Tank Bottom Recycled
3	30.31			"	
4	331.22			"	
5	179.14			"	
6	176.96	31.3	0.3	"	Tank Bottom Recycled
7	181.92			"	
9	31.68	32.7	0.2	"	Tank Bottom Recycled
10		32.7	0.2	"	Tank Bottom Recycled
12	174.89			"	
13	77.19			"	
14	53.97			"	
18	11.71	33.7	0.1	"	Tank Bottom Recycled
19	379.60			"	
20	191.62			"	
22	86.71			"	
25	5.52	32.2	0.2	"	Tank Bottom Recycled
26	157.31			"	
28	187.72			"	
29	242.73			"	
32	77.83	31.6	0.3	"	Tank Bottom Recycled
33	76.25			"	
TOTAL	2819.63			21 gallons	

134.27 bbls. dry oil/gallon of chemical

SECOND TEST RUN WITH VISCO

TEST DAY	OIL PRODUCED, BARRELS	GRAVITY	% B. S. & W.	AVG. VISCO CHEMICAL INJECTED	REMARKS
34	273.70			0.692 qts.	
35	144.75			"	
36	89.58	31.8	0.2	"	
40	15.72	32.3	0.2	"	
41	38.77			"	
43	215.72			"	
44	132.33			"	
47	258.20			"	
48	136.43			"	
49	128.10			"	
50	66.12			"	NO RECYCLING OR CIRCULATION NECESSARY WITH VISCO TREATMENT
54	218.45	32.6	0.2	"	
55	186.05	31.3	0.2	"	
56	97.98			"	
57	212.19			"	
58	119.85			"	
59	4.13			"	
60	296.99	32.6	0.2	"	
61	194.81	32.4	0.2	"	
64	59.26			"	
65	299.09			"	
66	73.01	32.6	0.2	"	
70	110.74			"	
71	211.75			"	
72	126.78	31.7	0.3	"	
TOTAL	3710.50			4.325 gallons	

857.91 bbls. dry oil/gallon of Visco

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7 One of Buzzini's power rigs, McAllen, Tex., at work on a town-lot location.

10 Catheads and accessories are mounted on rotary-drive engine; this is located across derrick floor from driller's console.

moved as one unit and at the same time stay within permissible road width of 12 ft.

The top-mounted radiators also enable the rig to be set up without any particular attention being paid to the prevailing wind. On conventional radiator installations it is necessary to set the rig so that the fans on the engines will not be fighting a local prevailing wind. Since the wind direction is upwards on these units the rig may be set at any desirable spot. Fig. 9 shows another view of the engines.

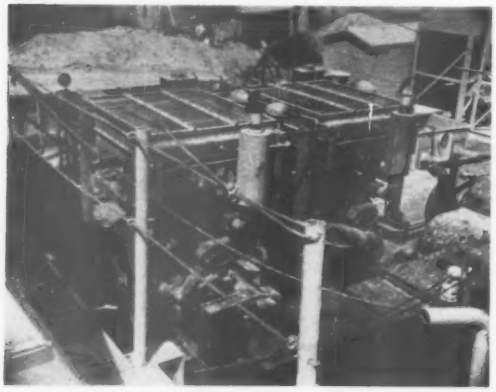
The updraft from the fans also lowers the temperature between the two engines so that it is possible for a mechanic to make adjustments while the engines are in operation without being subject to the intense heat usually present between engines on a drilling-rig compound.

Since the driller controls the rig from an organ-like console located on the derrick floor with full remote controls, the draw works is actually located beneath the drilling floor. In addition to the obvious advantage of a clean drilling floor the engines and draw works are placed on a truck-high platform which materially speeds up the erection of the rig and cuts down on the amount of handling required.

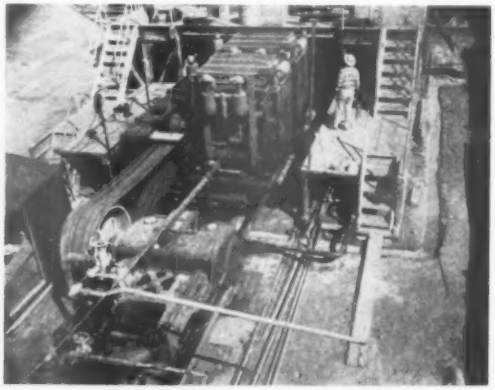
The catheads and other accessories on this rig are mounted on the rotary drive engine which is located across the derrick floor from the digger's console. See Fig. 10.

This particular rig operating in McAllen is drilling a directional hole, kicking out 1,600 ft. Because of the unusual location the rig is equipped with all city conveniences such as lights, water, gas, telephone and even an air-conditioned bunk house.

On an exactly similar rig, also owned by Buzzini Drilling Co., there was a recent demonstration of the unusual qualities of this rig. Circumstances were as follows: The rig was on location for The Texas Co. 3 North Eastern Farming Co., 4 miles north of Crystal City in Zavala County. While down at 10,300 ft., and after cutting a 50-ft. diamond core it was discovered that one of the two draw-works engines had a broken valve seat. Rather than take a chance on damaging the engine, it was decided to come out of the hole with one engine all the way from the bottom. This was accomplished in 5 hours and no trouble was experienced. In getting the core off bottom, the hole was a little tight and it was necessary to pull 250,000 lb. to pull through the tight spot.

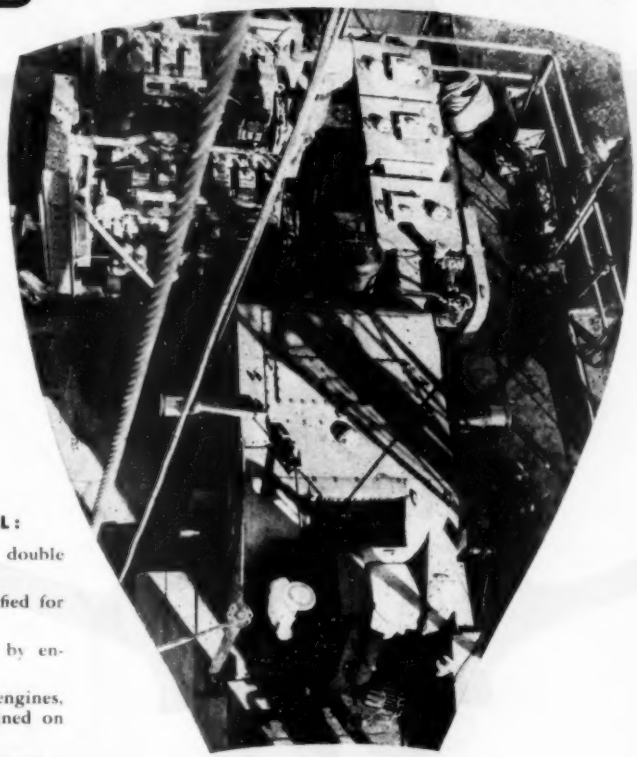


8 Radiators for the drilling engines are mounted on "top" rather than at the front end of each unit.



9 View of engines on a Buzzini power rig, looking in from mud pump. In this hookup, every direction is "windward."

Bethlehem M-58 ... It's a Winner!



Where else—in what other rig of its size—will you find so many advanced engineering features? Where will you find such power and flexibility? What other rig of its class can be moved from job to job so easily?

Bethlehem's M-58 is designed for depths from 5000 to 8000 ft with 4½-in. drill pipe. It meets a wider span of drilling conditions than anything we have ever before offered in this size and price range. It's a winner, and it's proved itself on the only true testing grounds—those ornery jobs in the field where every turn of the bit is a fight.

Here on this page we're listing a few of the M-58's most popular features. Study them over; compare them with similar points on competitive rigs. Then call a Bethlehem Supply man and ask for full details and performance records.

IN THE M-58 YOU'LL FIND THEM ALL:

Two- or three-engine drive with single or double pump drive

Mechanical drive system that can be modified for fluid drive

Extra-large, extra-powerful brakes cooled by enclosed circulating water system

Unitized construction with drawworks, engines, engine compound, and pump drive combined on one common skid

Engine compound and drawworks transmission clutches of disengaging spline type; master and high- and low-speed drum-drive clutches of extra-high-capacity air friction type

Disconnecting Airflex clutch-controlled pump drives

Engine compound of sectionalized type; complete rig can be broken down into loads of required road width

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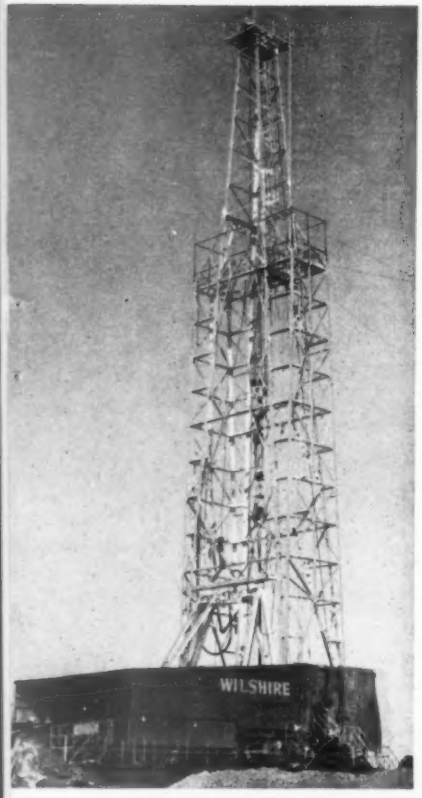
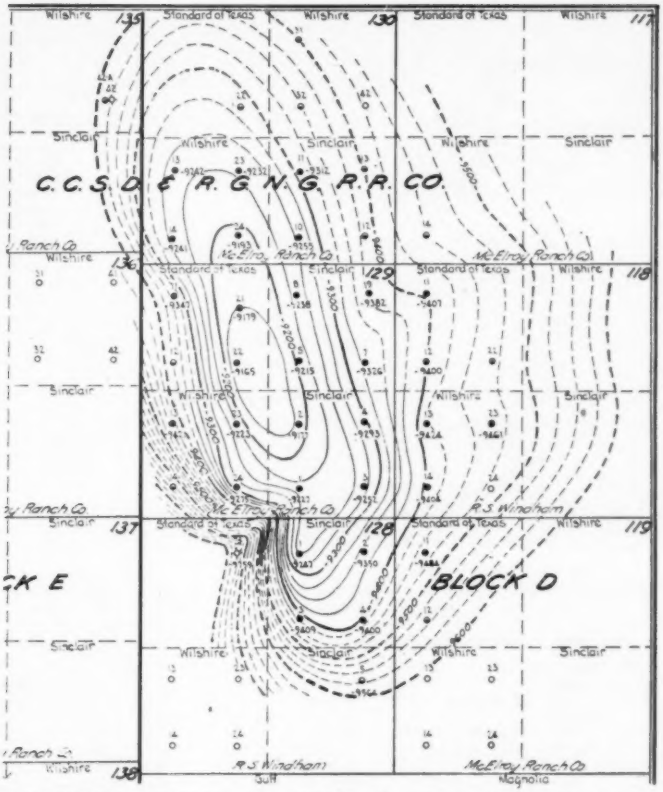


TYPICAL DRILLING RIG employed in development of Ellenburger dolomite reservoir in Wilshire Ellenburger field.



ASYMMETRICAL ANTICLINE with a NW-SE major axis is reflected in this subsurface structure contour map of the Ellenburger surface in Wilshire Ellenburger field. Contour interval is 25 ft.

A TYPICAL MIDLAND BASIN OPERATION

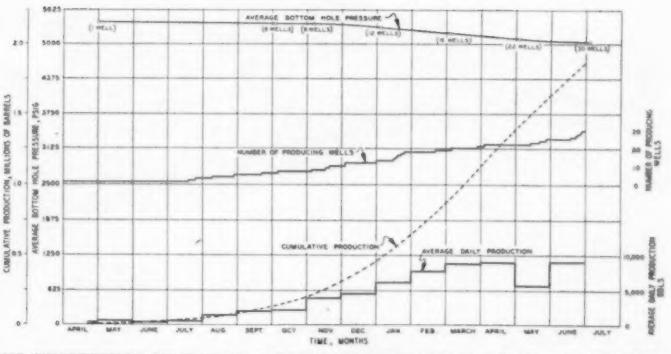
Deep Drilling in Wilshire Ellenburger Field

by Roy F. Carlson
West Texas District Editor

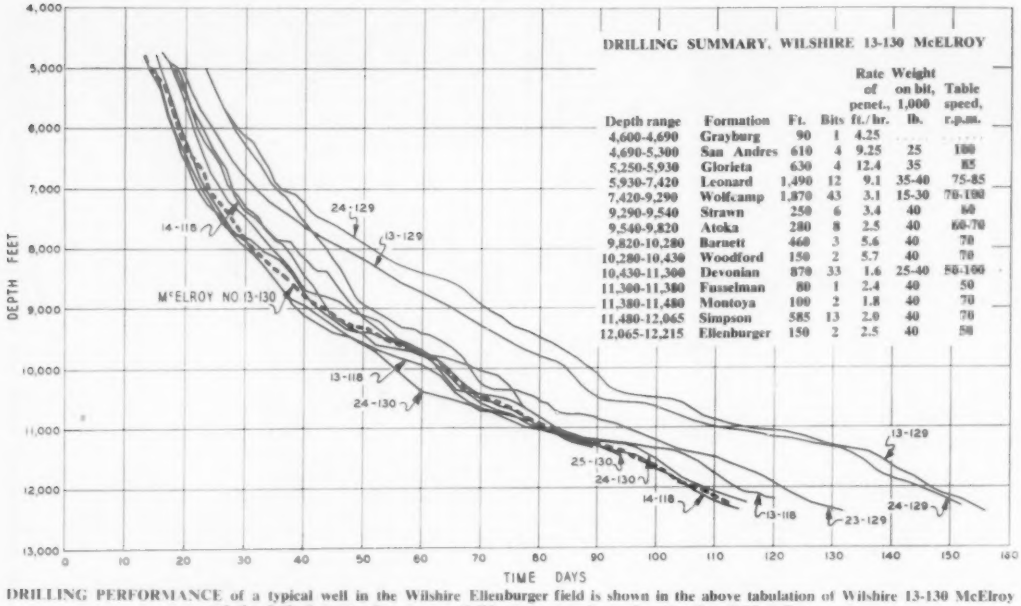
DRILLING holes 12,000 ft. deep still presents problems to the drilling contractor from an operational standpoint but these are no longer as formidable as they once were. Equipment for such drilling has been built and proven itself to be sound in a large number of wells 2 miles deep and deeper.

But hazards in drilling still have to be met and contended with in deep wells. This account of drilling in Wilshire Ellenburger field of Upton County, West Texas, illustrates a typical deep-drilling operation in the Midland basin.

The prolific fields in the central part of the Midland basin are normally pro-


AVERAGE BOTTOM HOLE PRESSURE
NUMBER OF PRODUCING WELLS
CUMULATIVE PRODUCTION
AVERAGE DAILY PRODUCTION
CUMULATIVE PRODUCTION, BILLIONS OF BARRELS
AVERAGE BOTTOM HOLE PRESSURE, PSIG
NUMBER OF PRODUCING WELLS
AVERAGE DAILY PRODUCTION BBLS
TIME, MONTHS
APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MARCH APRIL MAY JUNE JULY

OIL PRODUCTION STATISTICS of Wilshire Ellenburger field since discovery in April 1951.



DRILLING PERFORMANCE of a typical well in the Wilshire Ellenburger field is shown in the above tabulation of Wilshire 13-130 McElroy and the dashed penetration curve. (Solid curves are shown for 12 other field wells.)

HOLE SIZES AND CASING PROGRAM, WILSHIRE OIL CO. 13-130 McELROY

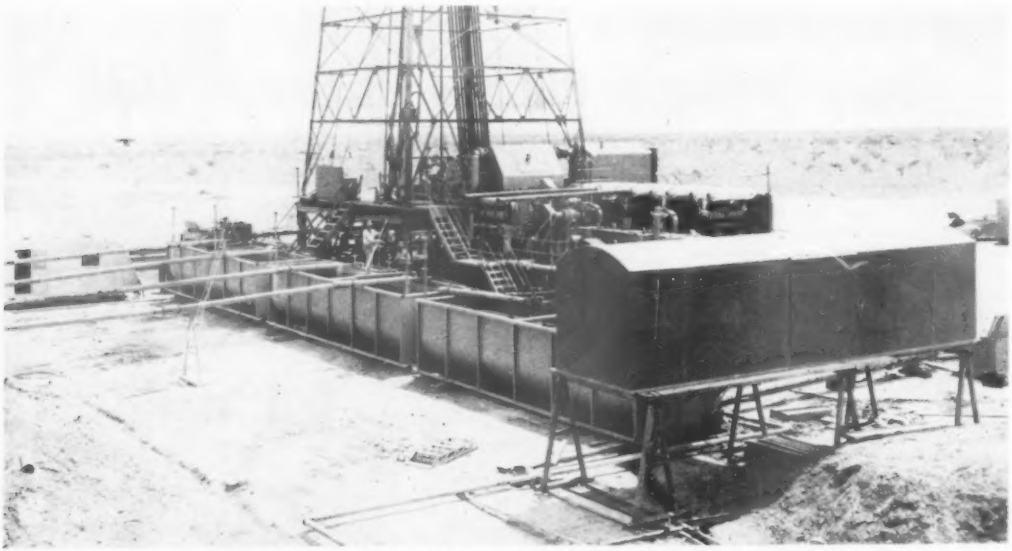
Depth range (ft.)	Bore-hole diam. (in.)	Type string	Casing diam. (in.)	Segments of casing design	Weight, lb./ft.	Type	Thread	Casing seat
0-215	15	Surface str.	13⅜					
0-4,735	12¼	Salt string	9⅝	(0-4,735)	36	J-55	8-rd.	4,735
0-12,066	8¾	Oil string	7	(0-5,600)	23	N-80	Extreme-line	
			7	(5,600-6,460)	26	J-55	8-rd.	
			7	(6,400-8,000)	26	N-80	8-rd.	
			7	(8,000-12,066)	29	N-80	8-rd.	12,066

DATA ON MUD PROGRAM:

Salt-water mud carried to 4,735 ft. Viscosity range is 35-40 seconds A.P.I.

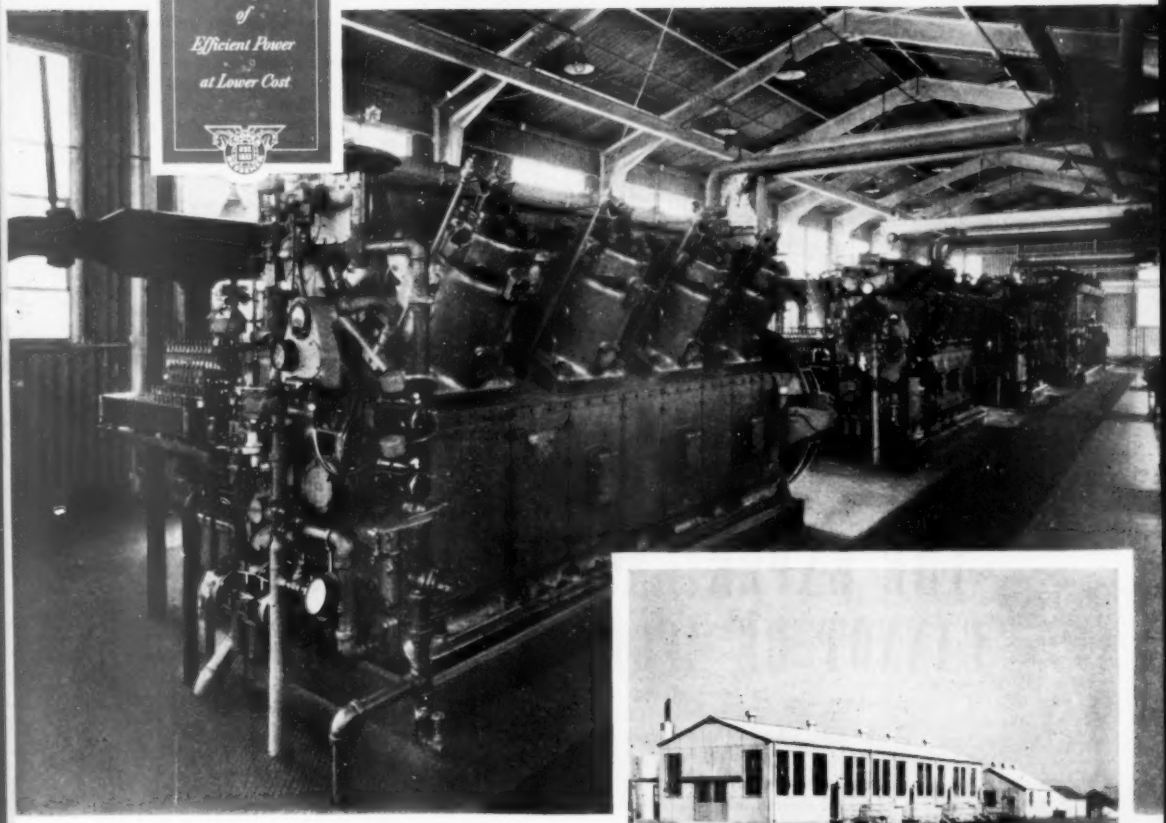
Fresh-water mud changeover at 4,735 ft. Lost-circulation additives carried continuously in mud through Permian San Andres, Glorieta, Clearfork, and Wolfcamp series.

Fresh-water bentonitic mud changeover at 9,000 ft. Mud weight, 9.0-9.6 lb. per gallon. Viscosity range is 120-200 seconds A.P.I. Water loss is 10-15 cc.



RIG LAYOUT of a typical drilling operation in the Wilshire Ellenburger field owned by Hewgley Drilling Co., Midland, Tex.

Another Example of Efficient Power at Lower Cost



COOPER-BESSEMER V-ANGLES ON THE JOB

Conserving Gas and Dollars

AT LONE STAR GAS COMPANY'S KATIE PLANT

THE answer to efficient, low-cost compressor service at Lone Star Gas Company's gasoline extraction plant in the Katie Field is this 2,560-horsepower line-up of Cooper-Bessemer V-angles. These units, 3 GMX's and a GMV, compress casinghead and low pressure distillate gas from about 60 psi suction to 415 psi discharge, for delivery to the absorber.

Of particular interest, the engines have automatic speed control and drive compressor cylinders selected for a wide range of operation without the use of unloading equipment. Add to this the fact that *every crankthrow*, all down the line, drives a compressor cylinder. Here's an economical, easy-to-maintain setup that makes the most of Cooper-Bessemer V-angle compactness.

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THE EXPERIENCE OF A PIONEER CANNOT BE ACQUIRED OVERNIGHT

The men who led the westward movement of our people across America's plains and mountains had to learn many of their lessons from one unfailing teacher. That teacher, then and to this day, is Experience. There is no substitute for it. You cannot enjoy its benefits by reading about it, nor merely by copying the actions of others or voicing, parrot-like, their well-learned principles. This is as true in learning how to protect fuels, lubricants and machinery from dirt as it was in learning how to protect those pioneering settlers from hunger, thirst or the attacks of savages. So we say: *The makers of Winslow Filters and Elements have been pioneering the principle and successful application of Full-Flow filtration for nearly twenty years.* We take pride in original patents which we hold, and we congratulate those other manufacturers who are finally beginning to endorse the same ideas. But to those of you who are buying *full-flow filters*, we repeat: The experience of a pioneer cannot be acquired overnight. For added value born of experience, specify Winslow Filters!

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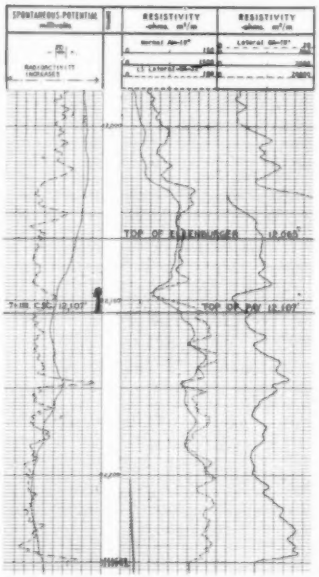
ducing from the Ellenburger dolomite which lies at depths over 12,000 ft. Wells are drilled in Wilshire Ellenburger field to depths of about 12,500 ft.

Other than the depth, chert and crooked hole have given most of the trouble in drilling operations in Wilshire field. Some wells have gone off vertical in excess of 8°, in spite of efforts to correct the drift. Normal straightening practices such as reducing weight on bit, varying rotary speed, varying number and size of drill collars, use of special bits, and use of stabilizers in the drilling string have not met with any marked degree of success.

Problems in Drilling Chert

The chert that gives the most trouble in this deep drilling is found at rather great depths, resulting in low rates of penetration, use of a large number of bits for the amount of hole made, and a like number of long round trips for bit replacement from these deep horizons.

A step toward solution of the chert drilling problem is available in bits specially designed for drilling this extremely hard rock. These bits, available in limited numbers, appear to look much like a "bald headed" ordinary hard-rock bit. The action of the bit is apparently more of a grinding than a chipping or hammering action, and is done by rather blunt inserts of extremely hard materials in the bit cones. These bits increase footage per bit and run longer than more conventional bits.



Type electric and radioactivity log of Ellenburger section in Wilshire Ellenburger field of Upton County, West Texas. The well is Wilshire Oil Co. 13-130 McElroy, Block D, CCSD & RGNG Survey, which was completed on June 22, 1952, for an initial potential of 3,219 bbl. of oil per day through a 1-in. choke on 2-in. tubing; open-hole completion was made in Ellenburger pay topped at 12,107 ft. Mud resistivity is 0.55 ohms m²/m. at 180° F. Electrode spacings are AM = 10-in., AO = 32-in., and AO = 19 ft. Hole size is 7⅞ in.

Mud and lost circulation have been a problem in much of the deep Midland basin drilling and Wilshire field is no exception. In the first place, water is hard to find in large quantities and in some instances has been trucked. Some concentrations of water have been found at considerable distance from the drilling operation and has required an expensive gathering and delivery system to be installed for delivery of drilling water and water for cooling in a gasoline plant recently completed in the field.

A saturated salt water is used to drill the upper part of the hole in the red bed, anhydrite, and salt sections to about 4,500 ft. Below this point fresh water is used in drilling to about 9,000 ft. From this point on a bentonitic mud is used having a weight of from 9 to 9.5 lb. per gal., a funnel viscosity of 120 to 200 seconds, and a water loss of 10 to 15 cc. Upon entering the Ellenburger pay the water loss is reduced to about 5 cc. Lost-circulation material is carried in the mud below the salt string of casing.

Drilling Practices

An accompanying chart shows drilling times for wells drilled in Wilshire Ellenburger field. Several casing programs are being used. Shortages in all kinds of tubular goods have resulted in many compromises in design of strings and in the sizes of pipe run.

Completion practices in the field include both the open-hole method and setting of casing through the Ellenburger and selectively perforating the pay zone. Future performance of the reservoir will probably prove which is the best method, but as yet, little concrete evidence is available as to the reservoir mechanism.

As illustrated by the accompanying structure map on the top of the Ellenburger dolomite the field is producing from an asymmetrical anticline with its primary axis trending northwest-southeast. This main axis roughly aligns itself with those of other deep fields in the Midland basin and parallels the eastern edge of the Central basin platform of the Permian basin.

As with most of the deep fields the Ellenburger is the terminal horizon in Wilshire Ellenburger field. However, shows of gas or oil or both have been found in higher formations, including the San Andres, Glorietta, lower Clear Fork, and the Dean sandstone of the Wolfcamp series. The Strawn (Pennsylvanian), Devonian, and Fusselman have also indicated gas or oil possibilities.

Reservoir Data

In the reservoir itself the original oil-water contact has been indicated at —9,742 ft. affording an oil column of about 577 ft. The reservoir oil has the following characteristics:

Average gravity (A.P.I.) at 60° F.	53.0
Average gravity of gas at 72° F. and atmospheric pressure	1.1
Original reservoir pressure (—9,500 ft.), psig.	5,386
Oil reservoir temperature, °F.	207
Saturation pressure of oil, psig.	1,805
Viscosity of reservoir oil at saturation pressure and reservoir temperature, cp.	0.300
Solution GOR by flash liberation to atmospheric pressure, cu. ft./bbl.	932
Formation volume factor at saturation pressure, bbl./bbl.	1.642

Cost of Wells

A normal well takes between 110 and 120 days to complete at a cost of about $260,000 and with the consumption of about 275 tons of oil-country tubular goods. The current top allowable production rate is 550 bbl. per well and a permissible gas-oil ratio is 1,500 cu. ft. per bbl. Wells are drilled on 40-acre spacing.

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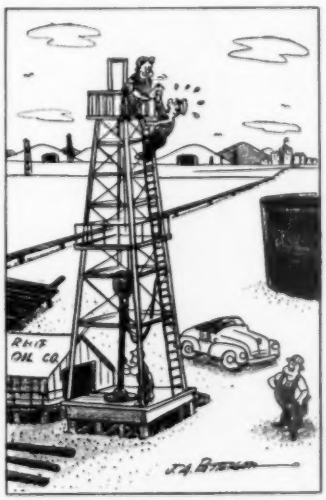

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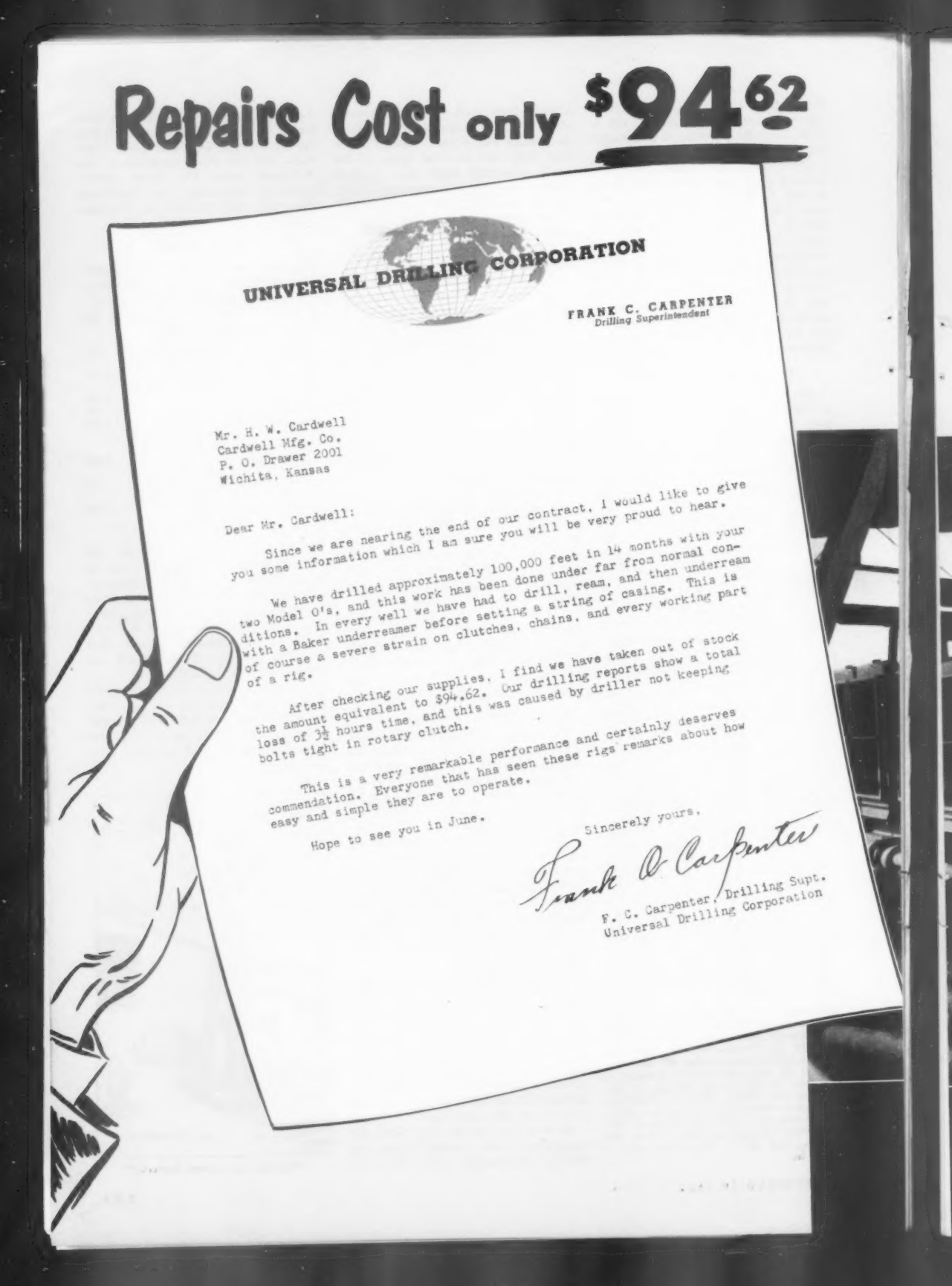

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Drilling Superintendent

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Cardwell Mfg. Co.
P. O. Drawer 2001
Wichita, Kansas

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After checking our supplies, I find we have taken out of stock the amount equivalent to $94.62. Our drilling reports show a total loss of 3½ hours time, and this was caused by driller not keeping bolts tight in rotary clutch.

This is a very remarkable performance and certainly deserves commendation. Everyone that has seen these rigs remarks about how easy and simple they are to operate.

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Frank C Carpenter

F. C. Carpenter, Drilling Supt.
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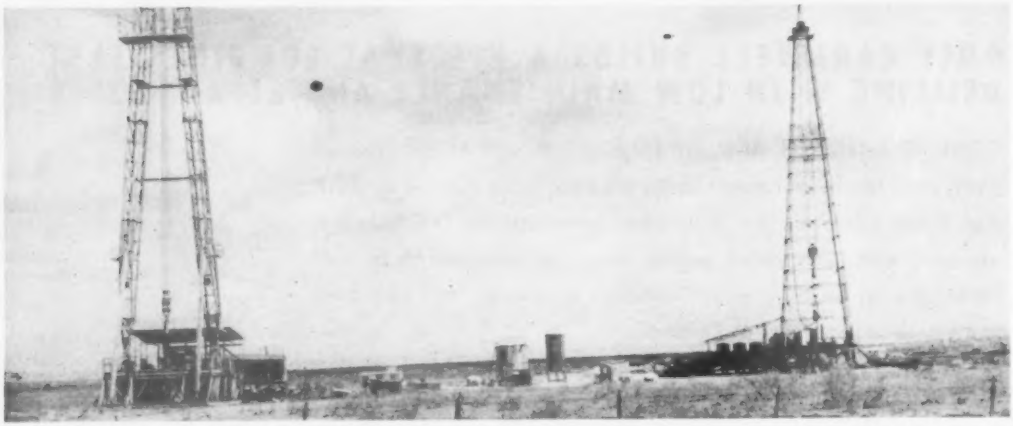

Two rigs used to drill one well

Drilling with compressed air in California

Drilling Practices Are Varied

As drilling rigs and equipment vary, so do drilling practices. Each operator or drilling contractor has his own specialties on how to "best" drill a hole in the ground in search for oil or gas.

Many novel techniques are applied daily, since each area of the country presents its own particular problems. But come-what-may, there's always somebody around who knows what to do to solve the problem and keep the bit going.

As in the upper photograph, for instance, two rigs are sometimes used to drill one well. This is particularly true in cases where a small drilling-in unit is required. However in this case the small rig on the left drilled the first 3,400 ft. of hole; then the big rig at right took over. Rig at left belongs to Gay, Inc., Odessa, Tex., and is inactive here. The larger rig belongs to Dixilyn Drilling Co., which completed the hole. Location is at Herman & George R. Brown-V. A. Brill 1 Fasken, an Ector County, Texas, wildcat.

Lower photo is view of "air drilling" operations in California. Bell & Burden, Inc., California contractor, used this rig to employ this method of drilling for the first time in that state. The technique was adopted by Shell Oil Co. at South Mountain field because of a severe lost-circulation condition in the first 1,000 ft. of hole. Major modification of the contractor's rig consisted of replacing mud pumps with nine compressors capable of supplying 3,500 cu. ft. of air per minute at 150 psi.

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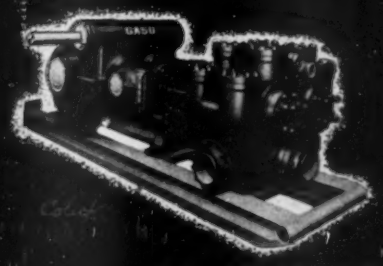

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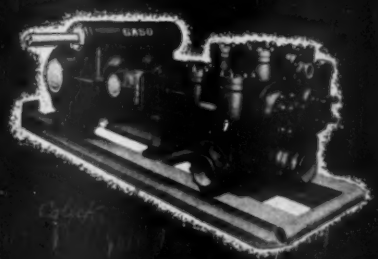

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New Drilling-Analysis Service Aids Operators in Rocky Mountain Area

Inauguration of a drilling analysis service by a group of petroleum engineers in 1951 has made much needed data on operations in the various geological areas of the region available in complete form to Rocky Mountain contractors and operators.

Improvement of drilling efficiency is the basic goal. To accomplish this objective, analyses in the form of detailed charts and accompanying discussion, which reflects various drilling experiences, procedures, and practices in the region, are being made available to participants in the service.

Both successful and unsuccessful wildcats, and development wells are chosen for analysis. Selection is made by both the participants in the service and the engineers who operate it, with the objective of typifying drilling in the particular area represented.

by E. A. Polumbus, Jr.

INDEX MAP of analyzed wells in Rocky Mountain region (Fig. 1).

A NEW drilling-analysis service is said to improve drilling efficiency by making available to operators and contractors complete analyses of drilling operations. This information reflects diversified drilling conditions, problems, and techniques practiced in the various geological areas of the Rocky Mountain region.

Wells analyzed to date are shown on a map, Fig. 1, of the Rocky Mountain area. These were wildcats, discoveries, or development wells which were selected either by the client or the engineering service because they typified drilling conditions in a certain portion of the Rockies.

Advantages of Service

Among the varied applications of drilling-analysis service are:

- Preparation of exploratory budget estimates.
- Setting up a developmental-well drilling program in a new area.
- Preparation of bids for a drilling contractor.
- Offering a guide in drilling operations to drillers and pushers.

The type of analysis presented on the two sample charted drilling operations has been prepared on 90 Rocky Mountain drilling operations to date. Some interesting and significant studies and findings made from these analyses, in addition to those discussed in the two sample charts, are enumerated below:

1. A number of charted drilling operations show penetration characteristics with water or native mud as compared with conventional drilling fluids.
2. Some analyses point up the economics of allowing a greater latitude in straightness of well bore where position of bottom of hole is not so important as regards lease boundaries or structural penetration of a pay sand.
3. Specific studies have been made as to the effect of oil-emulsion mud upon penetration rates.
4. Lost-circulation and / or water-flow zones are made evident. In one well, had surface pipe been set 150 ft. lower, 10 to 12 days of combating water flow might have been saved.
5. In one area where drilling progress is particularly rapid, completion and casing time amounts to 30 to 40 per cent of the over-all time. This directs attention to the importance of concentrating efforts to minimize these time items to lower development costs.
6. In a number of instances, the practice of frequent coring and reaming resulted in excessive time, suggesting that consideration should be given to either full-hole coring or coring longer intervals before reaming, thus minimizing trip time and bit consumption.
7. The importance of optimum drilling weights and rotary speeds in some areas is demonstrated in a number of analyses, whereas, in other areas pump capacity is shown as the principal drilling factor.

Selection of Wells

Of first importance is the selection of wells that are the most representative of areas of current or anticipated activity. In this regard emphasis to date has been placed upon the active Williston basin, North Dakota and Montana; Uinta basin, Utah; Denver basin, Colorado and Nebraska; West Side of Powder River basin, Wyoming; and deeper Big Horn basin, Wyoming, areas.

Particularly interesting wildcats even though not discoveries, such as Shell's Bluff Unit, southeastern Utah, and Mountain Fuel's Grizzly Buttes well in the south part of the Green River basin, Wyoming, are selected for analysis. Along with wells in currently active areas, some wells are continually being selected from presently inactive areas to expand the coverage within the Rockies. In development areas, subsequent wells are studied to illustrate improvement in drilling progress as experience is gained. In some instances wells are selected

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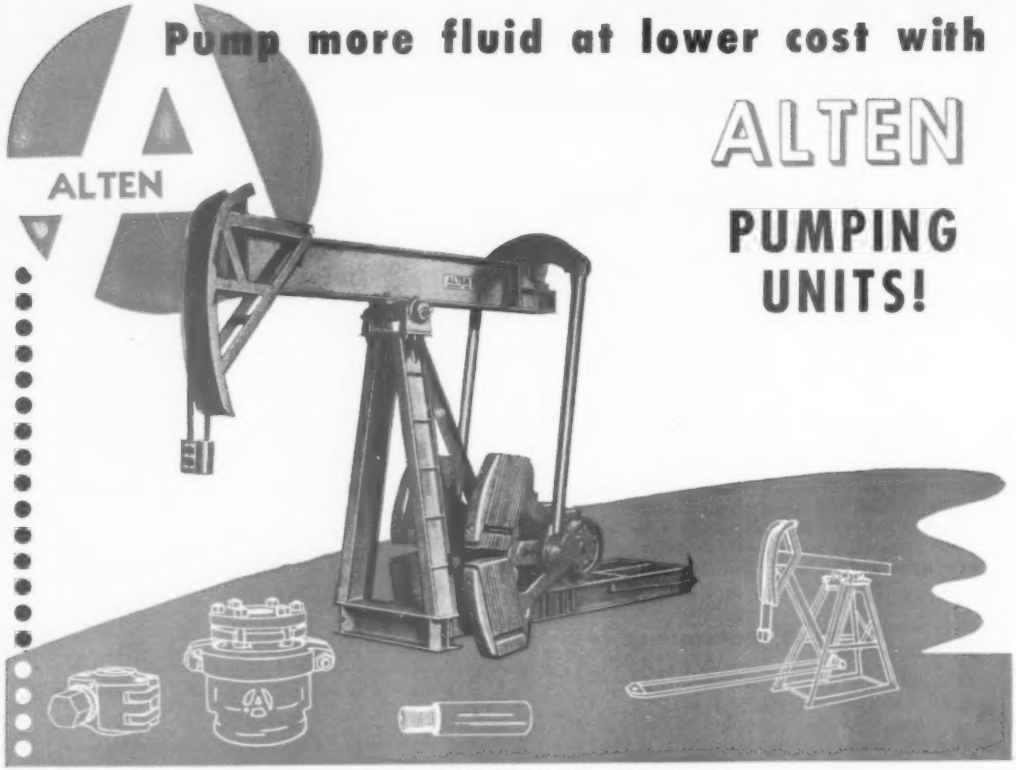

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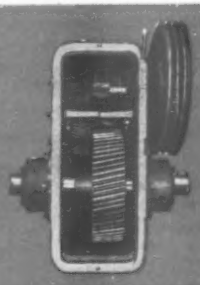

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THE AUTHOR

E. A. Polumbus, Jr., is a consulting petroleum engineer with headquarters in Denver. He was graduated in 1928 from University of Tulsa with a degree of bachelor of science in engineering and mathematics. On graduation he joined Carter Oil Co. and was assigned to the Seminole, Okla., district. After 18 years of service with Carter, he resigned to establish a consulting-engineering service at Denver. He has been located in the Rocky Mountain region for the past 8 years and is president of the Denver Petroleum Engineers' Club. He is author of an A.P.I. paper on the Uinta basin which was published in The Oil and Gas Journal, June 7, 1951, issue.

specifically to study drilling techniques. In all cases, whether a well is specifically selected to study techniques or to expand areal coverage, all factors related to drilling characteristics and conditions are carefully examined and presented to participants in the service.

The actual analyses answer two general questions. What was the experience in a particular operation from the standpoint of drilling progress and what procedures and net practices were followed to effect that progress? The answers to these questions are given in the form of information charted in complete detail and a supplemental discussion of any unusual problems or conditions with frequent comparative data presented. The discussion accompanying the charts attempts primarily to illustrate the various and numerous uses and applications of the charted analyses. Two charts are presented to illustrate the type of analysis.

Fig. 3 shows drilling practices and characteristics of a deep well in the Big Horn basin, Wyoming. The chart includes three drilling-progress curves. The first is the "Over-all Progress" commonly charted by operators and drilling contractors. It represents the actual time consumed in the operation from the surface to completion.

Net progress curve . . . The second and most useful curve is a "Net Progress" curve, which reflects normal drilling progress, excluding such time items as: lost circulation and hole conditioning; mechanical downtime; circulating samples and waiting on orders; fishing and/or drilling on junk; reaming, running casing, and waiting on cement; and completion time. In other words, the net progress curve includes: time on bottom; normal trips; connections; rig servicing; checking blowout preventer; and drift surveys.

It is necessary to include coring and reaming core hole in the net progress curve; however, this item is shown separately in a Time Analysis table. The third curve is a "Rotating Progress" curve which is simply an accumulation of time on bottom making new hole.

The time spread between the rotating progress and net progress curves is a reflection of crew efficiency and rig adequacy. It is of interest to compare this time spread from well to well and summer to winter by placing it on a basis of hours per normal trip. Trips for drill-stem tests, electric-log surveys, lost circulation, or for any cause other than removing a dull bit are not considered normal. In the Big Horn basin well this time spread averaged 7.2 hours per normal trip to a depth of 11,600 ft.

Time Analysis

The actual time from spud date to rig-release date in days and percentage of total time is given for significant time items in a table included on the chart. In the subject Big Horn basin well the high percentage of normal time plus coring and reaming core hole (71.3 per cent) indicates a well-planned and expedited drilling operation. If completion time of 23.3 days is excluded from the over-all time, this percentage would be approximately 80 instead of 71.3. Schlumberger, Lane-Wells, and drill-stem-test time of 10.7 days was high, as would be expected in a wildcat well of over 12,000-ft. depth. The table shows that a total of 6.2 days were required to mix mud, condition hole, and combat lost circulation.

Mud data . . . Mud additives used are included in a second table on the chart. Where there are significant changes in types of muds, the additives used are summarized for various depth intervals. In the example well to a depth of 4,050 ft., 593 lb. of clay was used per day. From 4,050 to 7,125 ft., 2,125 lb. of clays and chemicals was used per day; and from 7,125 to 12,283 ft., 5,340 lb. of clays and chemicals was consumed daily.

Bit performance . . . A third table on the chart gives a summary of bit and core-head performance. This table in conjunction with a column to the left of the progress curves, which shows where bits were run, plus the rotating progress curve gives a complete picture of penetration characteristics. The bit summary shows separate analyses of bit and core-head performance for drilling, reaming, and coring. This affords a comparison of coring rate with reaming rates and coring rates with drilling rates. For example, in the reference well, diamond-coring time varied from 1.7 to 2.6 ft. per hour, whereas, the core hole reamed at a rate of 4.2 ft. per hour.

Drilling factors . . . Drilling factors affecting penetration are represented in additional columns on the left side of the chart. These are: weights carried on bits, drill collars used, deviation of well bore from vertical, pump pressures, and drilling-fluid characteristics. Although in the Big Horn basin well the deviation did not exceed 2°, because of sudden changes in the drift of the well bore at 3,150 and 7,450 ft., drilling weights were decreased to correct the deviation. A maximum of 14 tons weight was carried on the bit. The greatest number of 6¼-in. drill collars used was 12. Pump pressures varied from 400 psig. near the surface to 1,400 psig. at the bottom of the hole.

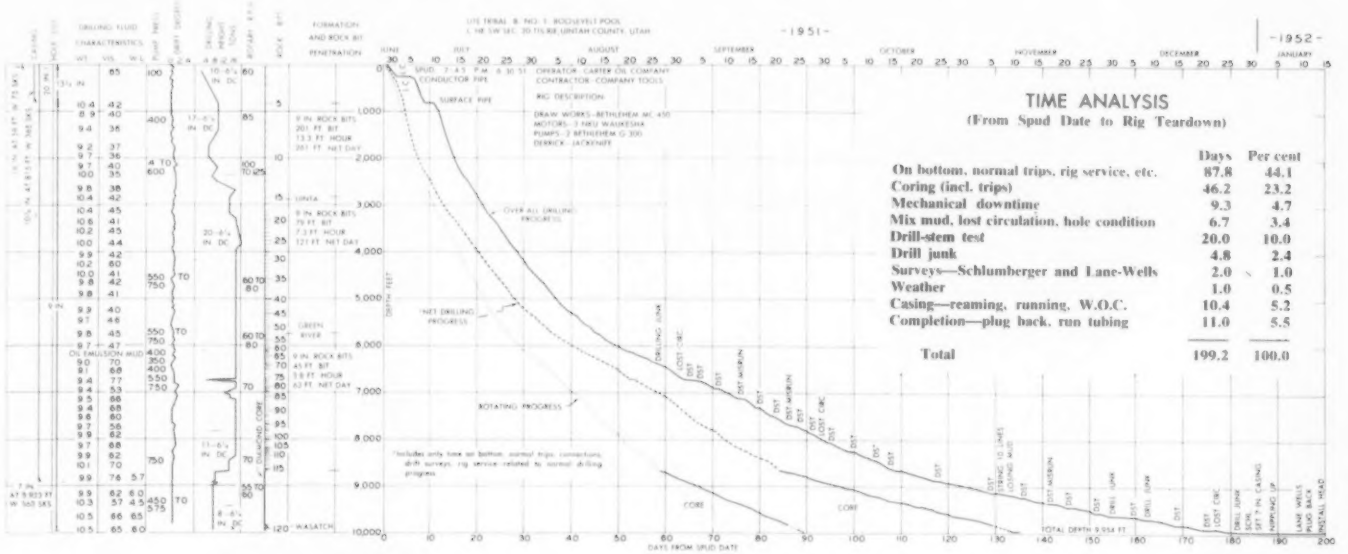
In the presentation of this Big Horn basin well chart to the participants in the service, a number of interesting observations were made in an accompanying discussion. It was pointed out that: "An outstanding problem in the drilling of this deep discovery was the tendency of the formations to slough and cave. This created a mud-control problem since mud designed to minimize this caving condition tended to reduce penetration rates. A 4,000-ft. intermediate casing string was run because of hole condition."

It was also mentioned that: "This chart further illustrates the effect of depth upon the penetration characteristics of given formations. The Frontier-Phosphoria interval required some 70 bits and 70 net days. Comparison of penetration characteristics of this geological interval in this well with the same interval encountered at shallower depths in other wells (Charts 25-H, 2-A, 21-A, 65-H and 66-H) is given in an accompanying table:

Pool—	Frontier-phosphoria interval, ft.	Mean depth, ft.	Ft. per day	Drlg. wt., tons	Rotary, r.p.m.	Mud properties		
						Wt.	Vis.	Wt.
Gebo	3,300	2,900	254	10-12	100	Water or native		
Glenrock	2,720	7,000	153	10-12	90	6-11	40-70	9.7-10
Meadow Creek	2,550	7,400	142	18-20	90	5-8	38-65	9.4-9.8
Sussex	2,400	7,500	89	15-20	70-80	3-5	50-70	9.6-10*
Slick Creek	3,200	8,800	69	15-18	70-110	3-7	50-60	9.6-9.9
Five Mile	2,720	10,240	39	12.5	60-110	3-7	48-90	9.5-10

*Partly native mud.

Typical Drilling Process Curves . . . Rocky Mountain Region



TIME ANALYSIS
(From Spud Date to Rig Teardown)

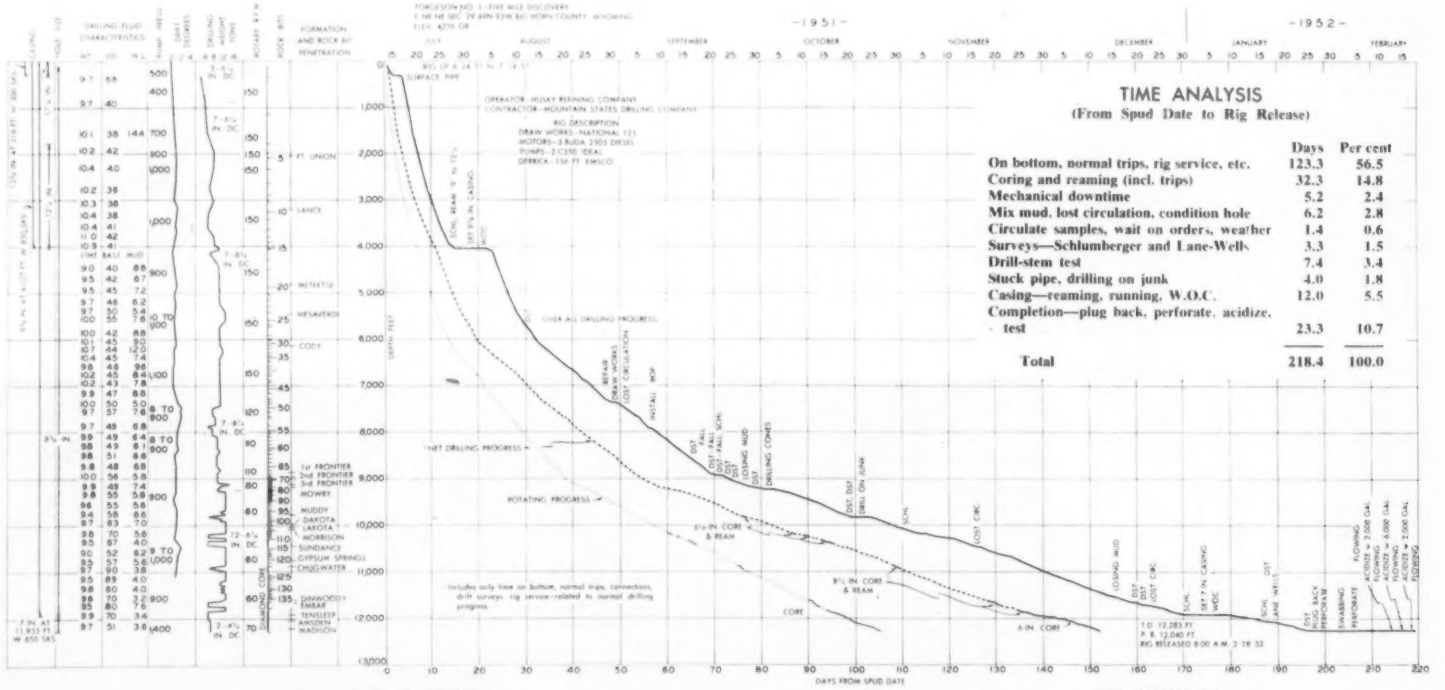
	Days	Per cent
On bottom, normal trips, rig service, etc.	87.8	44.1
Coring (incl. trips)	46.2	23.2
Mechanical downtime	9.3	4.7
Mix mud, lost circulation, hole condition	6.7	3.4
Drill-stem test	20.0	10.0
Drill junk	4.8	2.4
Surveys—Schlumberger and Lane-Wells	2.0	1.0
Weather	1.0	0.5
Casing—reaming, running, W.O.C.	10.4	5.2
Completion—plug back, run tubing	11.0	5.5
Total	199.2	100.0

MUD ADDITIVES
(Tabulated From Drilling Reports)

	50 days surface to 6,123		130 days 6,123 to 9,954			
	Total	Per day	Total	Per day	Completion	Total
Bentonite, lb.	83,800	1,678	70,000	538	26,400	180,200
Barite, lb.			461,200	3,550	71,800	533,000
Quebracho (and Tannins), lb.	12,250	245	17,625	136	400	30,275
Caustic, lb.	8,350	167	11,090	85	50	19,490
Barium Carbonate, lb.	29,100	582				29,100
Sodium Bicarbonate, lb.					300	300
Lime, lb.			500	4		500
Emulsifier, drums			26	5		26
Crude Oil, bbl.			222	1.7		222
Jel Flake, sacks			130			130
Fibertex, sacks			19			19
Wool, bales			7			7
Hulls, sacks	1		50			51

BIT SUMMARY

Size (in.)	No. bits	Footage	No. hours	Feet per hour	Feet per bit	Hours on bot. per bit
		DRILLING				
13¾	4	825	75.0	11.0	212	18.7
9	116	7,898	1,341.0	5.9	68	11.6
		REAMING				
20	1	62	14.0	4.4	62	14.0
		CORING				
8¾ dia.	(?)	1,231	669.3	1.8		



TIME ANALYSIS
(From Spud Date to Rig Release)

	Days	Per cent
On bottom, normal trips, rig service, etc.	123.3	56.5
Coring and reaming (incl. trips)	32.3	14.8
Mechanical downtime	5.2	2.4
Mix mud, lost circulation, condition hole	6.2	2.8
Circulate samples, wait on orders, weather	1.4	0.6
Surveys—Schlumberger and Lane-Wells	3.3	1.5
Drill-stem test	7.4	3.4
Stuck pipe, drilling on junk	4.0	1.8
Casing—reaming, running, W.O.C.	12.0	5.5
Completion—plug back, perforate, acidize, test	23.3	10.7
Total	218.4	100.0

MUD ADDITIVES
(Tabulated From Drilling Reports)

	14 days surface to 4,050		23 days 4,050 to 7,125		142 days 7,125 to 12,283			
	Total	Per day	Total	Per day	Total	Per day	Completion	Total
Bentonite, lb.	8,300	593	35,600	1,549	377,800	2,660	14,600	436,300
Barite, lb.					270,100	1,900	25,300	295,400
Quebracho, lb.			890	39	7,875	55	750	9,515
Driscose, lb.			775	34	5,700	41		6,475
Kembreak, lb.			2,350	102	10,400	73		12,750
Lime, lb.			4,650	202	41,775	294	350	46,775
Starch, lb.			4,575	199	45,050	317	150	49,775
Sodium Bicarbonate, sacks	25							25
Control Fiber, sacks					375			375
Seal Flake, sacks					78			78
Silvacel, sacks					60			60
Hulls, sacks					7			7
Strata Seal, sacks					3			3

BIT SUMMARY

Size (in.)	No. bits	Footage	No. hours	Feet per hour	Feet per bit	Hours on bot. per bit
		DRILLING				
12½	3	1,646	51.0	32.3	549	17.0
9	11	2,246	123.5	18.2	205	11.2
8¾	119.8	7,345	1,904.0	3.9	61	15.9
		REAMING				
17½	1	314	3.3	95	314	3.3
12¼	4	2,276	55.5	41	570	13.6
		CORING				
8½ dia.		473	184.3	2.6		
6⅛ dia.		102	61.5	1.7		
6 dia.		343	205.0	1.7		

8—8¾-in. drilling junk and conditioning hole. 4—6-in. conditioning and drilling retainers.

"It should be emphasized that wells included in the table were not affected by crooked hole to any appreciable extent."

Cite Case History

A charted analysis of a development well in Roosevelt pool, Uinta basin, Utah, shown as Fig. 2, is another example illustrating the use and value of drilling-analysis service. Outstanding characteristics readily apparent on the chart are:

1. Relatively high drilling weights carried (maximum 17½ to 20 tons) and large number of drill collars used (maximum, twenty 6¼-in.).

2. Relatively large number of bits used.

3. Large number of drill-stem tests taken and time consumed testing. (From time analysis = 20 days).

4. Relatively low footage per bit (68) and footage per hour (5.9) for 7,898 ft. drilled with 9-in. rock bits. (From bit summary.)

5. Large amount of footage, 1,231 ft., continuously and full hole diamond cored. (From bit summary.)

In the presentation of this chart to the participants it was stated that:

"This Roosevelt field well in the Uinta basin was run primarily to study the effect of oil-emulsion mud on penetration of the Green River formation. A first observation indicates a reversal of the net drilling-progress curve which would suggest that the oil-emulsion mud did improve penetration characteristics. Further study tends to refute this indication. A comparison with Chart 17-L, 2 Ute Tribal, shows a characteristic reversal in both wells thus suggesting that the reversal is probably due to characteristics of the Green River formation rather than the effect of drilling fluid. There appears to be a distinctively hard section in the upper 700-800 ft. of the Green River formation in the two subject wells. Penetration of this upper Green River section averages some 60 ft. per day and 32 ft. per bit as opposed to some 90 ft. per day and 50 ft. per bit for the next 1,000 ft. of Green River. This reversal in net-progress curve may also be noted in the Gusher wildcat in the same general area (Chart 16-L). One observation that should be made is that the present well drilled with oil-emulsion mud carried lighter drilling weights through the Green River as compared to the previous Roosevelt field well."

Comments on the charts stated further: "It is of interest to make a more detailed comparison of the two Roosevelt wells charted to date. The following tabulation illustrates the faster rate and lower footage per bit at 2 Ute Tribal as compared to "B"-1 Ute Tribal:

	"B"-1 Ute Tribal	2 Ute Tribal
Feet per hour	5.9	7.1
Total computed hours on bottom to 8,500 ft.	1,440	1,198
Number bits to 8,500 ft.	113	143
Feet per bit to 8,500 ft.	75	60

From the above table it may be noted that 2 Ute Tribal shows a gain of 242 hours on bottom over "B"-1 Ute Tribal; however, "B"-1 Ute Tribal had 30 fewer normal trips or 114 hours (estimated) due to using fewer bits."

This comparison illustrates the economics of sacrificing bits for time.

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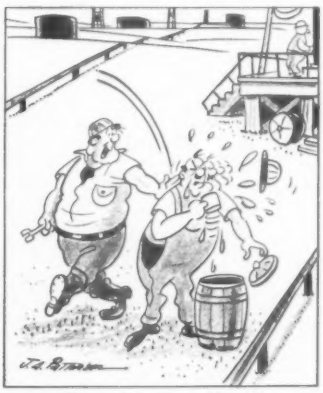

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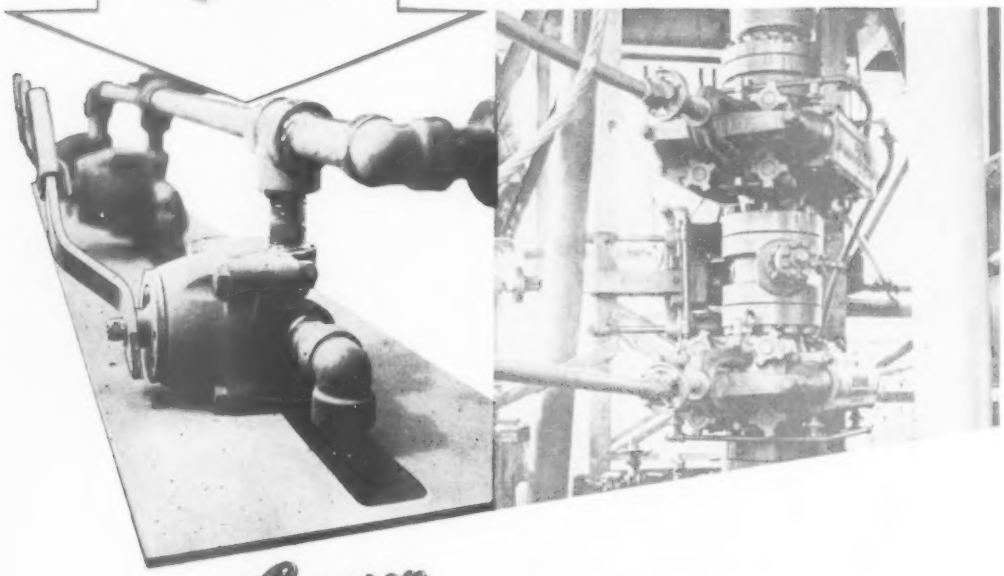

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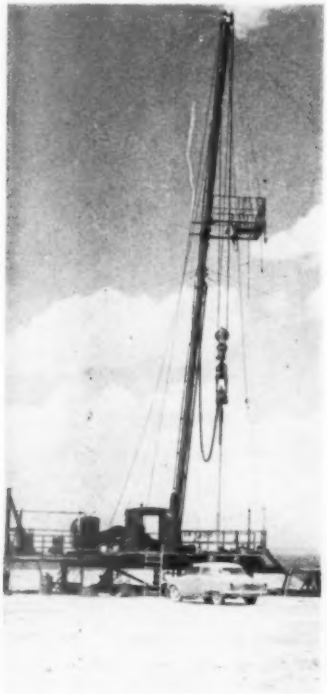


SHALLOW DRILLING is done by this Brown & Thorp rig, shown on location for a 3,000-ft. Clearfork test in West Texas. This is one of five rotaries belonging to the drilling company, which also has 10 cable-tool rigs.

Light . . .

RADIO EQUIPPED (see arrow), this rig is one of eight owned by Reading & Bates, Inc. It is shown on location for a 6,900-ft. test in Lea County, New Mexico, North Brunson field. Mast in background is Milhoan Drilling Co.'s.

Medium . . .

THIS HEAVY-DUTY rig, drilling for Ohio Oil Co., has passed the 15,000-ft. mark in Paloma field in California's San Joaquin Valley, and may go below 20,000 ft., to establish a new California depth record—if not for the world.

Heavy . . .

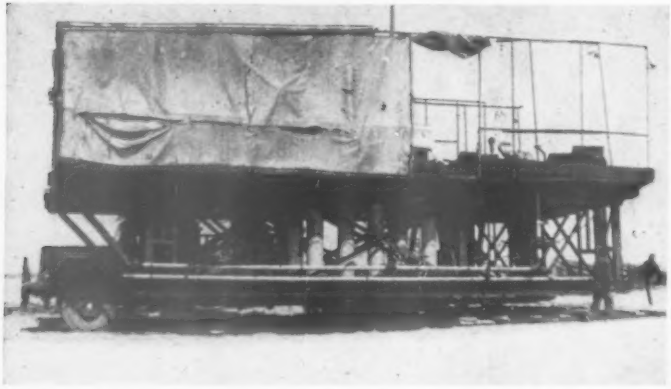
Drilling Rigs Differ . . . But They Seek One Thing in Common . . . Oil!

DRILLING rigs are as different as day and night. There are tiny "rigs" for shot-hole drilling and spudding-in; light rigs for shallow drilling; medium rigs for deeper drilling; and heavy-duty rigs for extreme depths. But each type of modern rotary rig is designed for a particular purpose—and it does that purpose quickly, efficiently and economically.

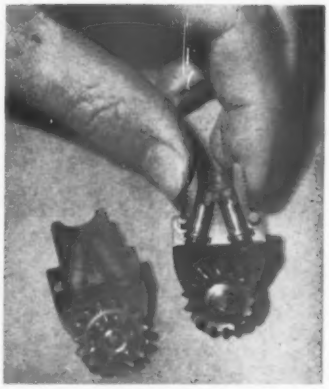
While there are many models of rigs in each of the rated categories, each is designed with the same sound engineering principles which incorporate stamina—a quality which gives the driller the equipment he wants to best do his job.

Manufacturers of rotary-drilling rigs are running their fabrication shops on a steady schedule, striving to keep up with the demand for more and more new rigs. The steel supply is tight and at times there are delays in delivery, but, as is true of the oil industry as a whole, the drilling divisions and the independent drilling contractors are getting the job done in spite of critical shortages of steel. Their ingenuity in "punching down a hole" has enabled this country to set new production records.

Areas are now undergoing intensive development which a few years ago even the most experienced geologist wrote off as "unfavorable for oil production." The wide variety of drilling rigs available to the industry, plus constant research by both manufacturers and operators, is enabling more holes to be drilled—deeper and faster—than ever before.



HUGE piece of equipment is this part of a Velma Petroleum Corp. rig, which includes most of the substructure for a medium rotary. It is so constructed that it will meet road-width requirements. Truck (can you see it?) belongs to Henry Leonard Trucking Co.



MINIATURE scale model of a jet bit designed and constructed by Humble Oil & Refining Co. engineers.

Equipment Comes in Varied Sizes, Too . . .

THOUSANDS of components go to make up the complete, modern rotary-drilling rig. And as an assurance that the important job of drilling for oil is done in an efficient manner, quickly and economically, the tool pusher sees that he always has spare parts on hand to take care of any emergencies that arise.

The supply store plays an important part in field drilling, also. There's always one nearby where the tool pusher or drilling superintendent can get additional supplies if the need arises. The supply companies' engineers are always around, also, to take care of any technical problem which might present itself.

Another important part played in field operations is the service company. Whether the job requires a cementing crew or an acidizing crew—the tool pusher knows he can find one nearby and remedial operations will be started in the quickest possible time.

Many parts of a modern drilling rig are either so bulky or weigh so much that they are not permitted on state or county highways, unless they can be broken down into sizes and loads which conform to official limits. Thus "portability" of equipment has become a by-word in the modern drilling industry. Unitized rigs—those having all components complete—are easily "broken" up into easy-to-handle "bundles." They're dismantled and rigged in an orderly manner, too, to save time and work.

YARD AND SHOPS of Rowan Drilling Co., Odessa, Tex. Rowan here does most of its servicing and repair required, except for major machine work. Ample space provides storage for equipment. Rowan runs 16 rigs out of this yard. The firm has operated continuously in West Texas since 1934. Mobile telephone service makes rig operation more efficient.

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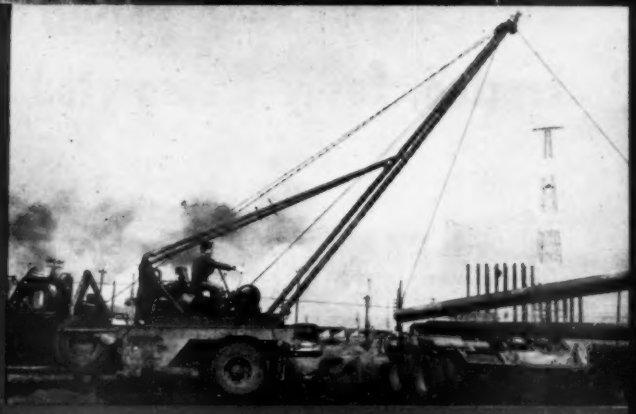

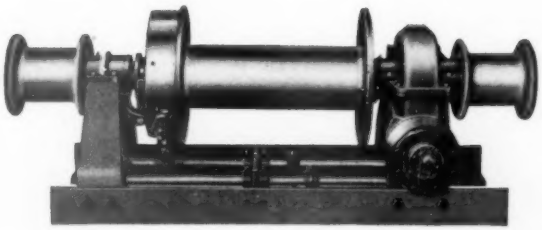

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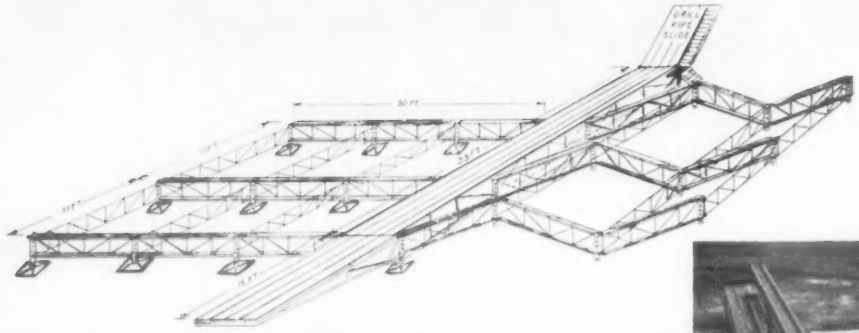


Isometric drawing (above) of new rotary rig pipe rack, and photo (right) of the unique "lay-down" device, in its operating position 3 ft. above level of catwalk and pipe rack sills.

TWO MEN—FEW MINUTES

Unitized Pipe Rack Quickly Erected, Easily Transported

by Walter F. Rose
Gulf Coast District Editor

THE trend in modern drilling practice is towards unitized rigs where portability affords economies in rigging up and tearing down and transport between locations. While much thought and effort have been spent on designing and building a pipe rack which could be easily moved from one location to another, makeshift pipe racks are often seen when traveling through the oil patch.

Even today, the wooden pipe rack illustrated in Fig. 1 is to be found on many locations. These require up to 1 day for building by a five-man rigging crew when starting from scratch, or up to ½ day when cut lumber is already available as is usually the case after moving from one location to another. On the other hand, the metal pipe racks of more modern design which are found on other locations require from 2 to 5 hours to erect, depending on the experience of the crew and the nature of the equipment.

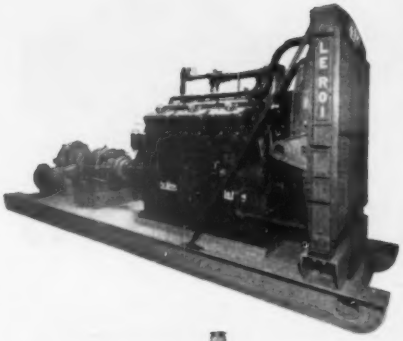
Portable Bridge & Equipment Co., of Houston, has designed a pipe rack which two men can rig up or tear down in just a few minutes. In addition is completely unitized and therefore easily transported between locations. This adjunct to rig layout, which is a major step forward in drilling practice, is described below by making reference to the accompanying pictures.

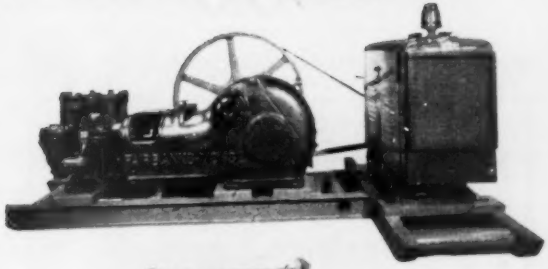
The problem . . . The question comes up, why waste a day rigging up a "nineteenth century" pipe rack, after the latest and most modern type of jack-knife mast has been raised. For if the portable jack-knife type of equipment is being used, the pipe rack cannot be erected until the mast is out of the way. On reflecting on this question, almost any roughneck could sketch on paper the essential features of a pipe rack which would unfold like an accordion and which would end the labor of erecting piece by piece the hand-made pipe rack. The unitized pipe rack described here is a practical solution to the drilling contractor's problem of minimizing rigging-up costs.

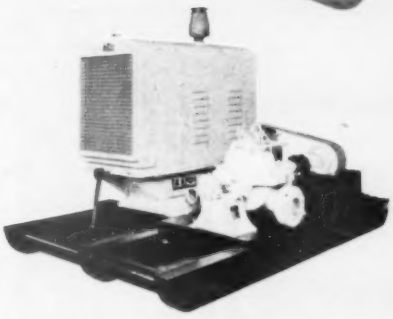
1 OLD STYLE . . . Wooden pipe racks are often ill fitting, creaky, dangerous, and time wasting.

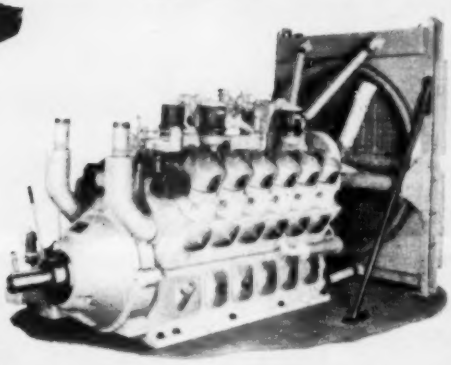
2 NEW STYLE . . . Unitized-type steel pipe rack is neatly folded up and quickly loaded, transported, and set down via trailer truck.

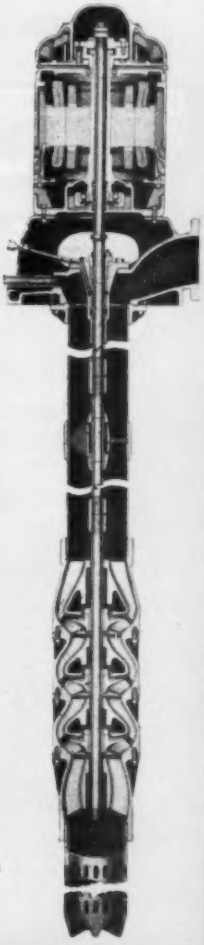
Powerful Picture

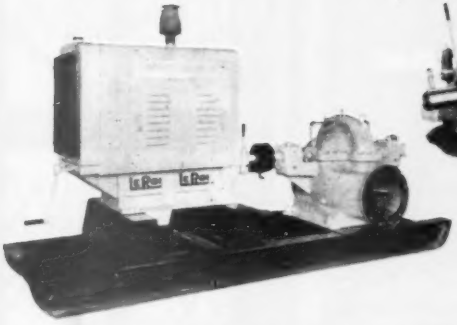


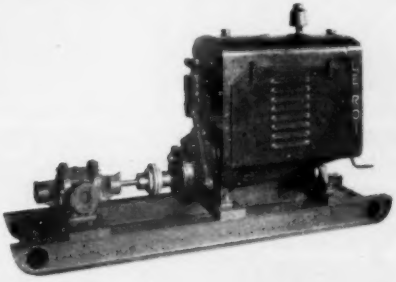












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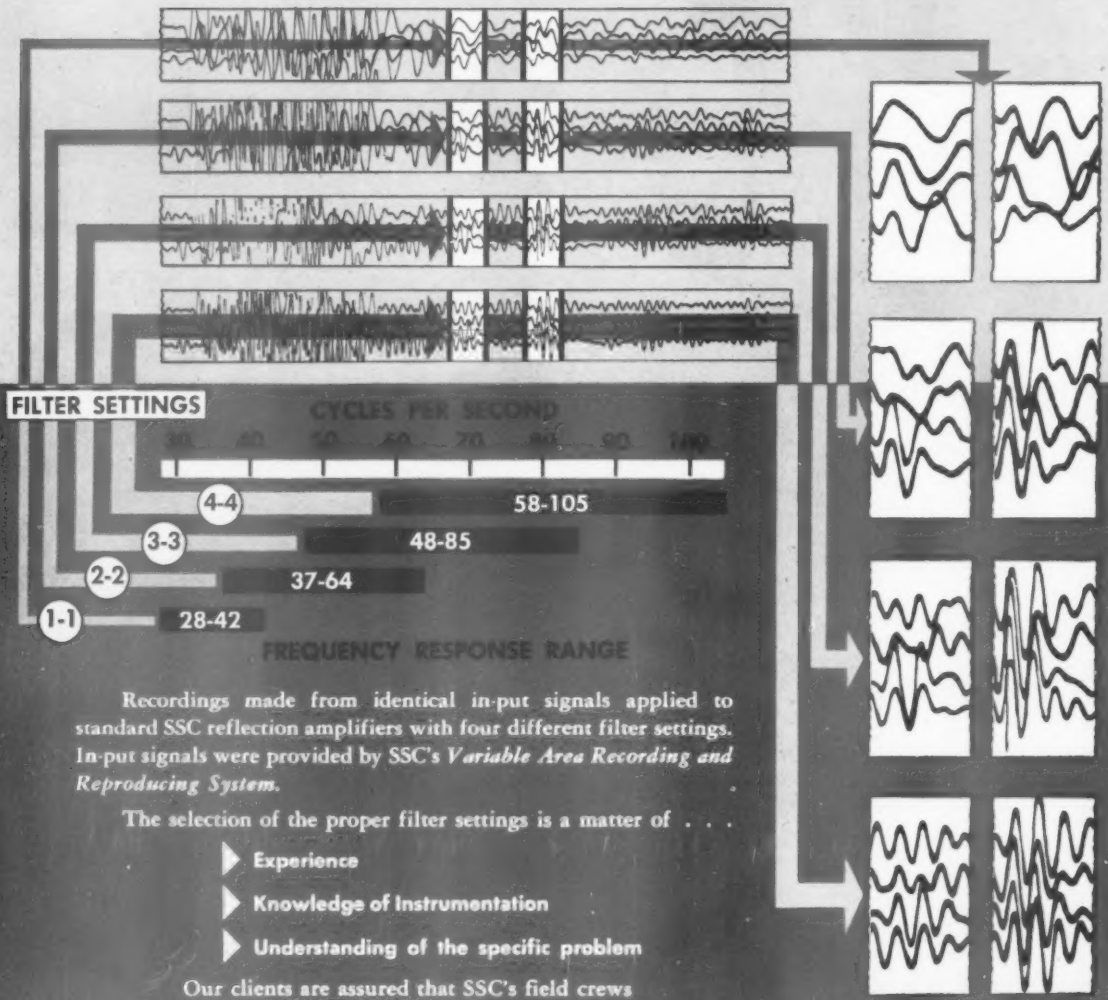

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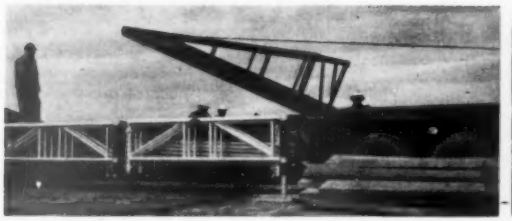
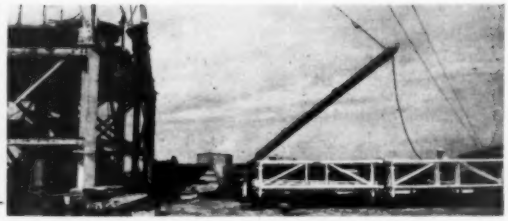
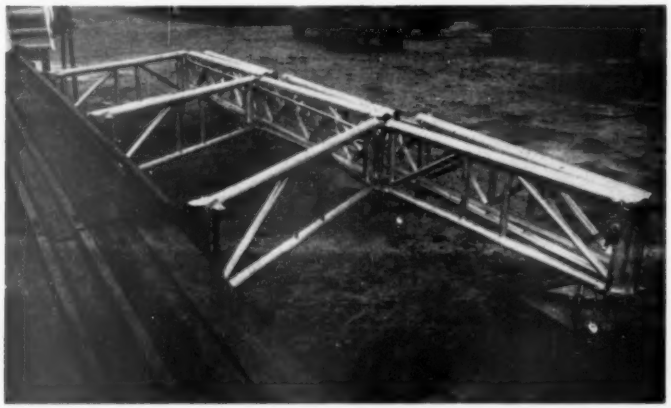


3 CATWALK EXTENSION . . . Now going up, by winch line from truck.



4 PIPE SLIDE and stairway section, to be folded over onto derrick floor.



5 UNITIZED SILL SECTIONS . . . These are shown folding out into place; columns and shoe supports adjusted.

and the roughneck's dream of avoiding unnecessary toil.

Housh Drilling Co., of Houston, is the first drilling contractor to make use of the new unitized pipe rack engineered by Portable Bridge & Equipment Co., on a location near Columbus, Tex. This first test of the equipment has proved singular advantages.

General description . . . On the new pipe rack the sills which support the stacked pipe are unitized with a catwalk so that during transport they can be folded against the catwalk to make a compact and portable skid-mounted package.

Assume that the pipe rack is in the folded position and is being carried by a trailer-truck as shown in Fig. 2. The following installation steps are followed in rigging up the rack:

1. The truck is backed up towards the "V" of the derrick, and the folded rack is aligned so the catwalk will be in proper relation to the derrick floor. The end of the rack skid nearest the derrick is then laid down on a board support, the height of which is determined by the slope of the terrain. The other end is lowered on the ground and supports the columns and bearing shoes on the skid section so that the catwalk is level.

2. The catwalk extension is opened back with the aid of the truck winch line. See Fig. 3.

3. The pipe-slide and stairway section are folded over to the derrick floor by means of the catline. See Fig. 4.

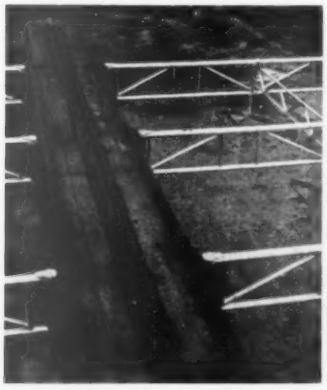
4. The unitized sill sections are folded out into place, and the columns and shoe supports are adjusted. See Fig. 5.

The unitized pipe rack illustrated has a 50-ft. catwalk, and the pipe-supporting sills extend out 30 ft. on each side of the catwalk. The sills in turn are separated by 11 ft., giving a total of 22 ft. between the front and back pipe supports. This size rack is designed to support about 12,000 ft. of pipe on each side, or a total load of almost 100 tons (figuring an average of 16 lb. per foot of pipe). Larger unitized racks of this same design could, of course, be built.

On the other hand, the pipe-rack dimensions when folded in the skid position are 34 ft. long by 8 ft. wide, which is the maximum size for highway transport in Texas without a special permit. If a larger rack were desired, for example one which would have 40-ft. sills, the skid width would only be increased to 9 ft.

The catwalk . . . The 50-ft. catwalk is 4 ft. wide, and is comprised of a metal pipe laydown device in the center, and board planking on the sides. Edges are also provided along the length of the catwalk to prevent pipe from rolling off.

The metal pipe-laying device is in the form of a trough or track in which the end of the pipe section can ride



6 LAYDOWN DEVICE . . . View in nested position.

7 COLUMN SUPPORTS . . . Have 30 in. of adjusment.

as it is being lowered from or raised to the derrick floor.

During drilling operations when pipe is being taken from the pipe rack the laydown device is nested flush with the deck boards of the catwalk, as shown in Fig. 6. On the other hand, when the pipe is being stacked, as when coming out of the hole, the laydown device is raised to a position 3 ft. above the level of the catwalk and pipe-rack sills. In the raised position the pipe can be rolled off directly on top of pipe which has already been stacked, thus avoiding the labor of the usual practice of rolling pipe from a lower catwalk to the top of previously stacked pipe. In the raised position, arms extend out perpendicularly from the laydown device to facilitate rolling the pipe off to the rack.

It is the intention in future models of the unitized pipe rack to engineer into the laydown device fingers which will automatically trip the pipe off to the sills. This will eliminate the need of having a roughneck on the pipe rack during stacking, which has always been a hazardous occupation. As it now stands, only one man is required on the pipe rack during stacking.

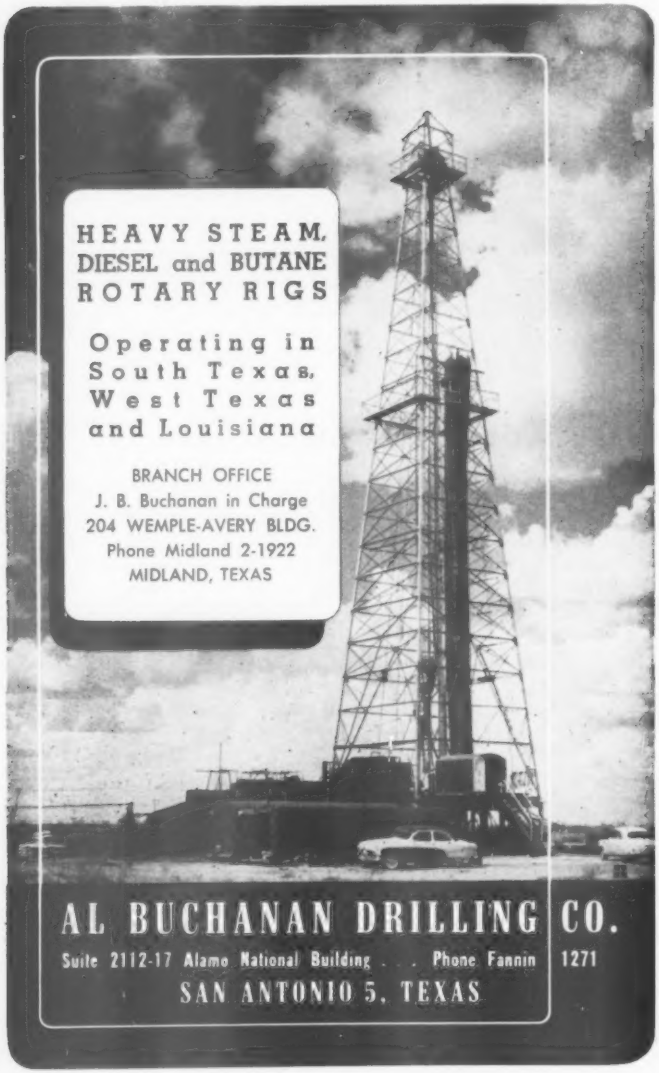
Leveling pipe rack . . . Each column support has 30 in. of adjustment. This means that within limits a level pipe rack can be set up on sloping or uneven terrain. Moreover, the adjustment of the column supports is an operation which one man can handle. See Fig. 7.

Fig. 7 shows that each column support is comprised of three parts: The outer column which is welded to the sills and braces; the inner lower column which is locked in position by means of a 1-in.-diameter solid rod pin; and the column foot which rests on the ground. When the sills are folded out, the pin is removed and the lower column is dropped into the foot which is resting on the ground. The pin is then replaced and stable support is thus achieved.

The outer column and the lower inner column have a series of holes which provide pin positions every ½ in. for over-all 30 in. where adjustment can be obtained. Basically, the leveling of the pipe rack thus is seen to be achieved by getting the catwalk skid level before the sills are folded out since the columns which support the sills subsequently are simply dropped into place. Moreover, it should be pointed out that if greater than 30 in. of adjustment is required, longer-length inner columns are provided.

The feet supports of the sill columns, also seen in Fig. 7, are of unusual design. They have the shape of square cups, and experience has shown that they can be laid down in soft mud and still give satisfactory support through a bridging action which squeezes the soft mud into a compact mass. Further, the feet are provided with handles and they weigh about 60 lb. These features enable one man to lift the feet when the rack is being torn down (i.e., folded up) and moved to a new location.

A. P. Robishaw, chief engineer of Portable Bridge & Equipment Co., deserves credit for the design and development of the unitized pipe rack.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CYPRESS-FILLED SWAMP made necessary the construction of modified piling platforms for use with auxiliary barges.

PILING IS DRIVEN by the derrick barge shown above at The California Co. 2 St. Martin Land Co. at Plumb Bob field.

Piling Platforms Solve Drilling in Coastal Swamp

Cypress-filled swamp in Louisiana's Plumb Bob field prevented use of drilling barge

by Joseph A. Kornfeld
District Editor

USE of two pile platforms with auxiliary barges conquered a difficult surface location job in the swamps of South Louisiana for The California Co. in recent months. The field is Plumb Bob Bay in St. Martins Parish, 18 miles northeast of Lafayette. The area lay in the Morganza floodway in a swamp filled with cypress stumps and knees, willow thickets, and water hyacinths. There was a wide variation in water levels—18 ft. up and down swings. The soil had a low bearing capacity.

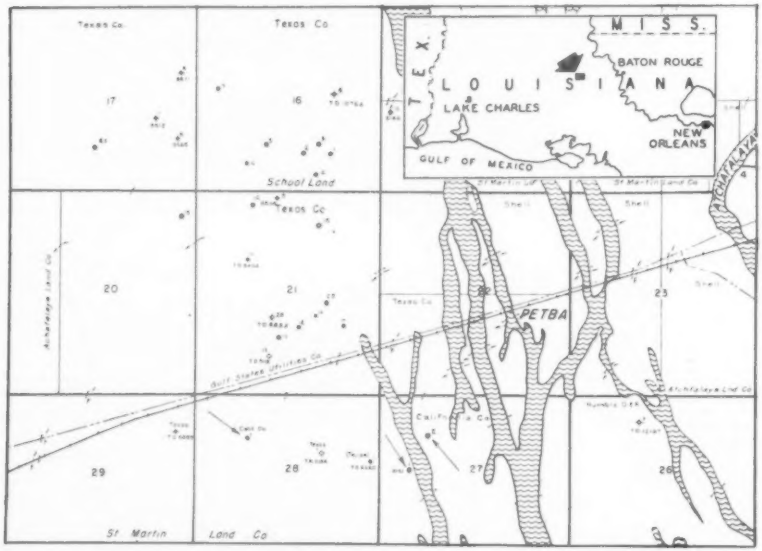
The first decision facing Calco engineers was what type of structure could be used to support the drilling rig. The only manner in which a conventional drilling barge could be used would be to construct an artificial mound. On the top of this mound a barge could be sunk. However, the great difference in water levels precluded the use of this method. Calco engineers selected a platform on piling as most practical for the swamping terrane. Here again two types of construction on piling were considered:

Comprehensive layout . . . a complete platform on piling large enough to support all of the equipment and materials required for drilling the well; or a

Rig-draw works piling . . . A small layout to support the derrick, drilling rig and draw works with a tool slide. Auxiliary barges would support power plant, mud pits, dry mud, crew quarters, and pipe racks. Economics dictated the choice of the latter.

The plan of drilling structure was designed by the Gulf Coast division engineering department of The California Co. The central platform which supports the drilling rig, derrick, and draw works measures 50 by 70 ft.

Auxiliary barges . . . In conjunction with the central platform are three auxiliary barges. Two of these barges are lashed together, 26 by 100 ft. each. The barge



MORGANZA FLOODWAY in the Atchafalaya River bottoms is the locale of development on the southeast side of the Plumb Bob field in St. Martin Parish, Louisiana.

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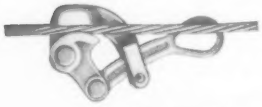

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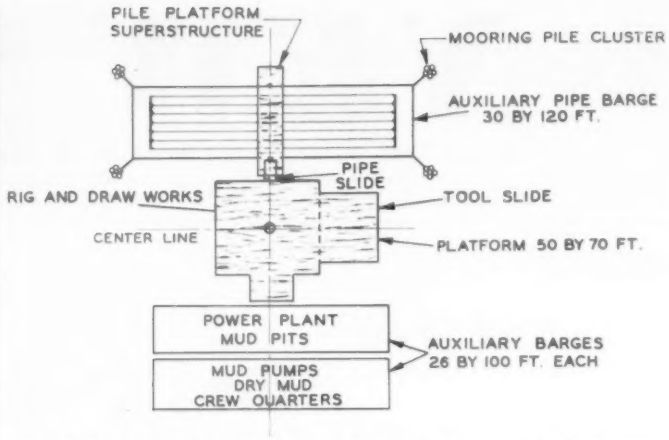
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CENTER LINE
PLATFORM 50 BY 70 FT.
POWER PLANT MUD PITS
AUXILIARY BARGES 26 BY 100 FT. EACH
MUD PUMPS DRY MUD CREW QUARTERS

FLOOR PLAN of drilling structure employed at Plumb Bob Bay by Calco engineers.

nearest the rig supports the power plant and mud pits. Another contains mud pumps, dry mud, and crew quarters.

The largest barge is 30 by 120 ft.; it contains the pipe racks. It is connected with the rig platform through a pipe slide which is adjustable according to water level.

Auxiliary platform . . . An unusual feature of this installation is the construction of an auxiliary platform superstructure built over the center of the pipe barge at right angles to its longer axis. The platform down the center of the barge divides it into two equal sections; this permits separation of various sizes of casing and assists in maintaining a balance on the barge. This platform extends above and beyond each side of the barge.

The overhang closest to the derrick-floor platform meets the pipe slide, while the overhang on the opposite side of the auxiliary platform prevents the pipe from dipping into the water when it is picked up.

Mooring arrangement . . . Allowance for changes in water levels are made between the pipe barge and the sloping pipe slide (which connects the barge to the derrick floor) is brought about by mooring of the pipe-rack barge between four pile clusters with soft lines; this permits moving of the pipe barge closer to or farther from the sloping pipe slide.

This type of platform-barge arrangement has been used on three wells to date by The California Co. The third test is drilling below 9,808 ft. at this writing; the first two wells were completed as oil wells. After each well is completed, the three barges are moved out leaving in place the central pile platform and the auxiliary platform.

The Calco development is on the southeast side of this deep-seated salt dome field and development is in Miocene zones ranging from 10,310 to 10,596 ft.

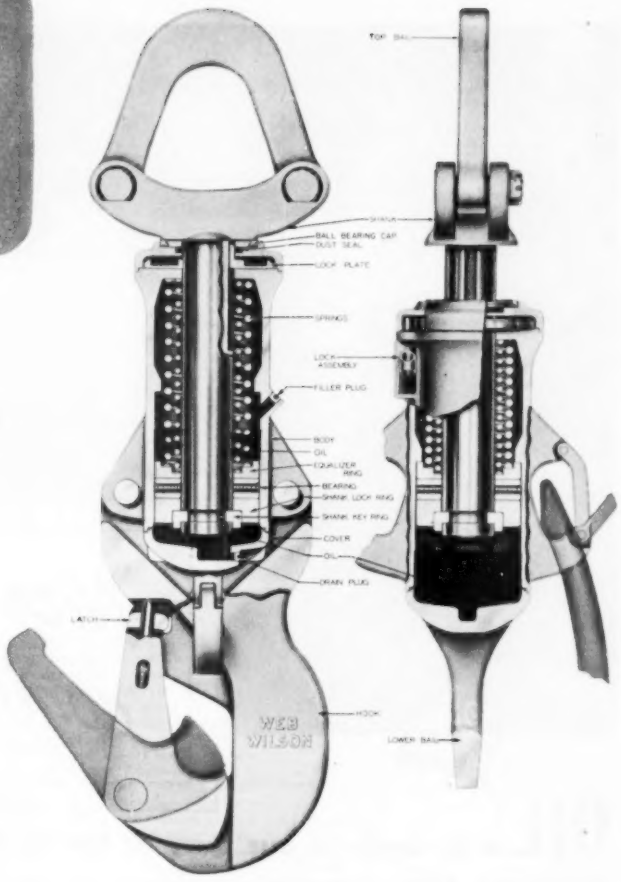
Loffland Brothers owns two cargo barges used for auxiliary drilling operations. These house a National 3410-FE draw works powered by two 350-hp. diesel-electric engine generator sets. There is a single 400-hp. standby prime mover. Slush pumps are Models C-350 and C-250. A "D"-50 pump is used for mixing mud.

Days to drill . . . Thirty days are required to construct the drilling structure and to rig up. A total time of 70 days is required to drill and complete on a 12,000-ft. contract. Loffland Brothers Co. is contractor at Plumb Bob Bay for Calco. The following casing program is being employed:

Item—	Size (in.)	Casing seat (ft.)
Conductor	16	200
Surface pipe	10¾	2,000
Long string	7	11,000
Tubing	2½	10,560

No intermediate string is run and open hole carried under the surface shoe may be as much as 9,000 ft.

Completion . . . Long string is set through the objective oil sand series in the Miocene and gun perforated for completion. A typical completion gage is Calco 1 State Lease 1,882; it flowed 166 bbl. of 30.4°-gravity oil on an 8/64-in. choke through perforations from 10,558-96 ft. Initial gas-oil ratio was 506 cu. ft. per bbl. Initial flowing tubing pressure was 1,075 psig.



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. . . contain an "oil-bath" in which the plunger and bearing operate. This oil cushion not only insures perfect lubrication of the bearing, but also provides controlled hydraulic action of the spring,—an exclusive feature which eliminates bouncing the pin-end thread on the box end of tool joints when breaking out, and avoids battering the threads and sealing shoulders of tool joints. ★ The oil cushion feature minimizes shock on hoisting equipment and the entire drilling string, and makes the tool ideal for jarring or fishing.

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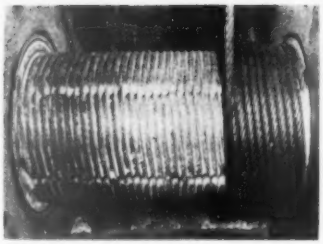

Fig. 1—A controlled pyramid system type of grooved drum, showing the angle controlled section of grooves in center, and parallel grooves above and below and extending around back side of drum core.

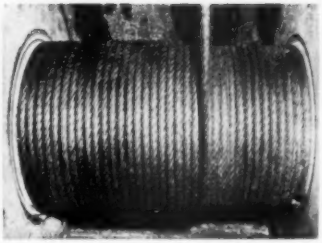

Fig. 2—The same drum with more than one layer of wraps, showing how the lower layers make parallel grooves or tracks in which the wraps of the upper layers follow.

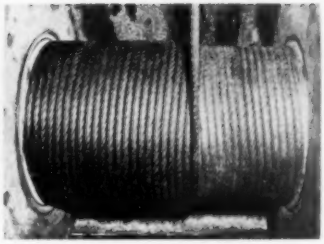

Fig. 3—A picture of the same drum as Fig. 2, taken from the other side, and showing the angle control section and the point of cross-over.

Walter Rose, Journal district editor, Houston, interviews
Frank L. Lebus, Sr., president, International Engineers, Ltd., on

How to Spool Wire Line for Maximum Service

Q. Can you start off by listing the several fundamental elements that are important to the spooling of wire line in rotary drilling. Then we can discuss each of these items separately to evaluate their relative importance.

A. I shall state first, and hope to have the chance to prove later, that grooving the drum is the foundation of good spooling of wire line. Grooving is not a cure-all, however, as spooling is usually improved by the use of stabilizers and turn-back rollers. With certain types of drum grooving, the installation of end fillers and line kickers is required. In any event the distance between drum flanges is an important consideration, as is the traveling-block weight.

Q. Since you attach so much importance to the use of grooved drums, could you bring me up to date by giving the historical development of this device?

A. Because of the difficulties experienced with some of the earlier grooving patterns, most rig operators began machining the grooves off of their hoists during the 1930's. This renewed the trend of providing rigs with plain drum hoists.

Q. At the time of which you are speaking, had the practice been adopted of progressively feeding new line into the spooling system as wear and tear occurred and some old line was cut off the drum?

A. No. In fact it was only when rig operators had been sold on the economies of buying long wire lines and following a cutoff procedure that the inherent limitations of the plain (ungrooved) drum hoist became apparent.

●

More and more attention is being given by drilling contractors and oil-company drilling departments to ways and means of extending the useful life of wire line in drilling-rig operations. Active assistance and cooperation in this endeavor has come from the rig and wire-line manufacturers, and from other oil-industry service groups.

LeBus International Engineers, Ltd., is an example of a service company which has pioneered in the technology of wire-line service, and in the questions and answers which follow, the founder of this company gives what must be recognized as expert opinion on the solution of wire-line problems.

Anyone with experience in the drilling industry realizes that poor spooling practice on the draw-works drum results in excessive wire-line wear. This in fact has been the starting point for LeBus who has designed, and now manufactures and installs, grooving for drum hoists intended to prolong wire-line service. The following discussion is not limited to the Lebus system of grooving, however, as other important components of satisfactory spooling are both known and must be considered.

●

The problem of "cutting in" became very troublesome.

Q. Please explain this, and also what is meant by the term, cutting in.

A. Cutting in refers to the way a wrap of wire as it is being spooled on the drum falls down between underlying wraps which have been previously spooled. It is a problem because the line becomes weakened at the cut-in point, and because it means that wraps on succeeding layers will also cut in. Cutting in is a regular source of trouble, even with spooling on certain types of grooved drums.

Q. You were saying that cutting in was a problem especially when plain drum hoists were being used.

A. Yes. When operators began buying longer lines and feeding in new wire as the spooled wire became weakened by wear, the serious problem of line cutting in showed up again. In this case, the reason was that the new line was being fed into the spooling system of worn line. When a layer of worn line is hammered up snug on the drum core, it is impossible to track a layer of new line wraps of a larger diameter onto the layer of worn wraps. What results with the new line failing to track on the worn line is that wide gaps are left at varying intervals and the next layer of line cuts into these gaps.

Q. Do you have any other remarks on the problems of line cutting in?

A. I should point out that line cutting in become an increasing problem as wells are dug to greater depths. When running pipe back into the hole the traveling block, hook and elevators are raised to the top of the mast without enough load weight to cause the wire-line wraps to spool on the drum as tightly as necessary.

When the heavy pipe stand is picked up and connected to the long string of pipe already in the deep hole, the hoist operator picks up the combined weight of the entire string of pipe to a height of about 4 in. to remove the pipe slips. Then as the pipe is being lowered this great weight all of a sudden becomes registered back on the loosely wrapped line on the drum. The slipping line creates gaps which then result in cutting in and contribute to wire-line wear. I shall probably have occasion again

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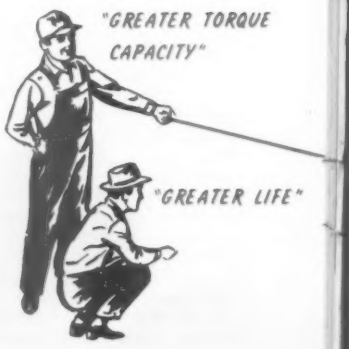

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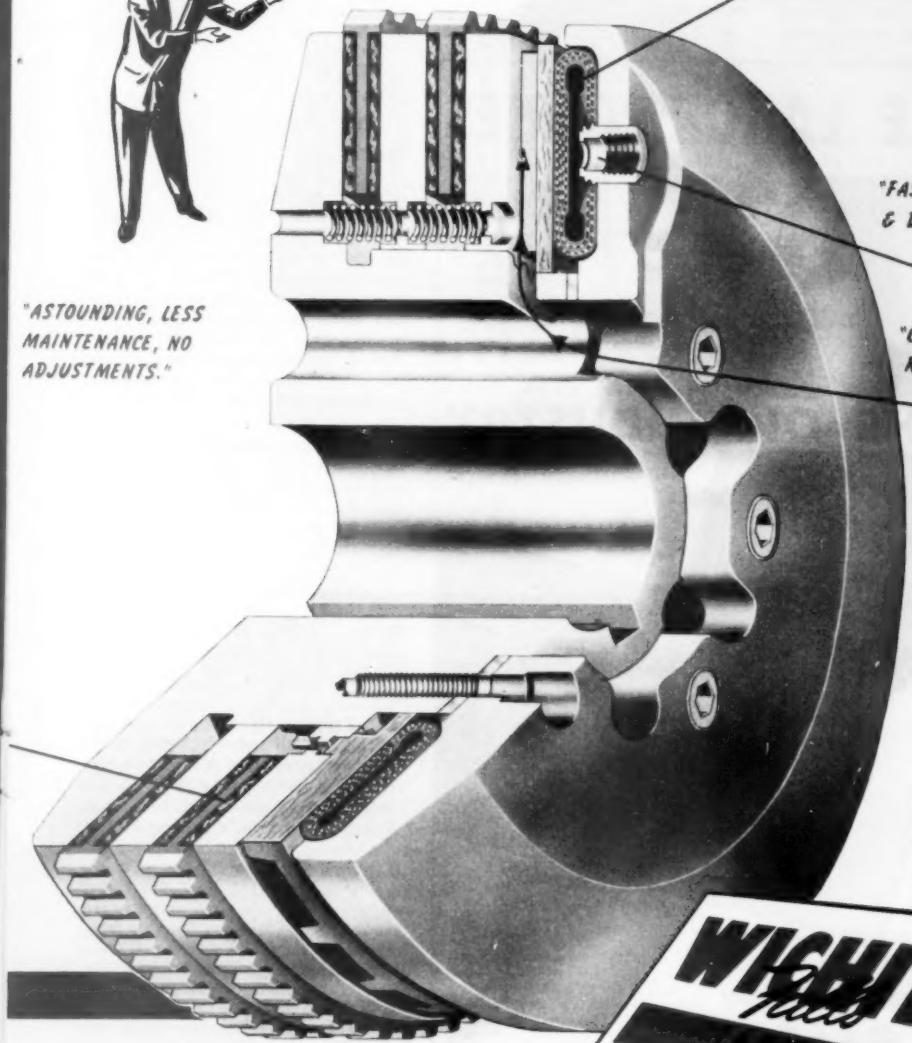

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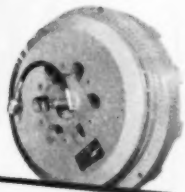

WICHITA

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Ad—101

to emphasize the importance of using a heavy traveling block and hook, regardless of how small or large the hoisting unit is.

Q. You have given me a series of pictures illustrating the type of drum grooving which your company manufactures, and which you recommend as an aid to minimize cutting in and other spooling problems. Will you describe your so-called pyramid spooling system?

A. The LeBus system of spooling wire, illustrated in these pictures (see cuts) eliminates the 100 per cent helical angle on which wire line has been spooled in the past. Most of the grooving runs parallel to the hoist flanges, and the rest of the grooving (called the angle control section) makes the wireline progress across the drum core within a limited area during the hoisting operation. Having this angle control in such a small area (approximately 15 to 25 per cent of the circumference of the drum), parallel spooling is created on approximately 75 to 85 per cent of the circumference of the drum. Incidentally this percentage is regulated by the drum core diameter.

Q. What are the characteristics of spooling when this type of grooving is employed?

A. As you begin picking up the load and the line starts wrapping on the drum, the line progresses across the drum within the limited area of the angle controlled section of the grooves. When one layer is filled, the kickover of the line as it wraps back is confined within this same limited area of the drum on every succeeding layer of wire line. This system among other things has completely eliminated the double crossover wave, and the majority of wire-line whip which was a common characteristic of the old method of helical spooling.

Q. You might elaborate further on the characteristics of the spooling on the outer layers.

A. Let me repeat again that one of the greatest sources of trouble in wireline spooling in the past has been the cutting in to the preceding layers. Under the new system of controlled pyramid spooling where 75 to 85 per cent of the wire line forms grooves for the wraps in the succeeding layers, there is accomplished what might be called progressive grooving. That is, most of the wire in each layer is parallel to the drum flanges so that most of each layer of wraps forms a system of grooves for each succeeding layer, minimizing greatly any occurrence of cutting in since there is no tendency for the line to crowd over or slip over out of the line grooves formed by the lower layers of line.

Q. You use the phrase, "minimize cutting in." Under what conditions can it occur even with the controlled pyramid system of grooving?

A. Even with the best grooving job, cutting in can occur when the operator becomes careless and continues to use excessively worn wire line; or if his traveling block, hook, and elevator are too light; or if he is operating the drum hoist in such a manner as to cause the wire to be spooled too loosely on the drum.

Q. I suppose this is the basis of your statement that "proper grooving is the foundation of a good spooling of wire line, but it is not a cure-all."

A. You are quite correct. In the matter of block weight our experience is that hoisting units used to drill to 7,500 ft. or less with 1 or 1⅛-in. wire line should have traveling block, hook, and elevators with a combined weight of not less than 8,000 lb. when using six lines, or not less than 12,000 lb. when using eight lines strung into the blocks. Hoisting units used to drill to between 12,000 and 14,000 ft. using 1⅛ to 1¼-in. wire line should have this weight between 15,000 and 20,000 lb. To drill to greater depths this weight should be proportionately increased to say 20,000 to 30,000 lb. If these recommendations

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are followed, cutting in will be greatly minimized.

In the matter of avoiding slack line, we offer this suggestion to the rig operator when he is raising an unloaded block to the top of the mast. Let the hoisting drum coast with the traveling block by throwing out the clutch before taking the foot off the throttle. If the reverse is done an excess amount of slack line will be thrown between the fast sheave of the crown block and the drum, causing it to spool loosely, and in some cases causing the wire line to jump two or three wraps and leave a gap.

In the matter of the operator using worn line, we have various recommendations based on our own experience and the experience which has been shared with us by wire-line manufacturers and rig operators. These recommendations attempt to set up a schedule for making drum end cutoffs so that new wire is periodically (but not prematurely nor belatedly) brought into the draw works.

Q. Please describe some of the features of your cutoff recommendations.

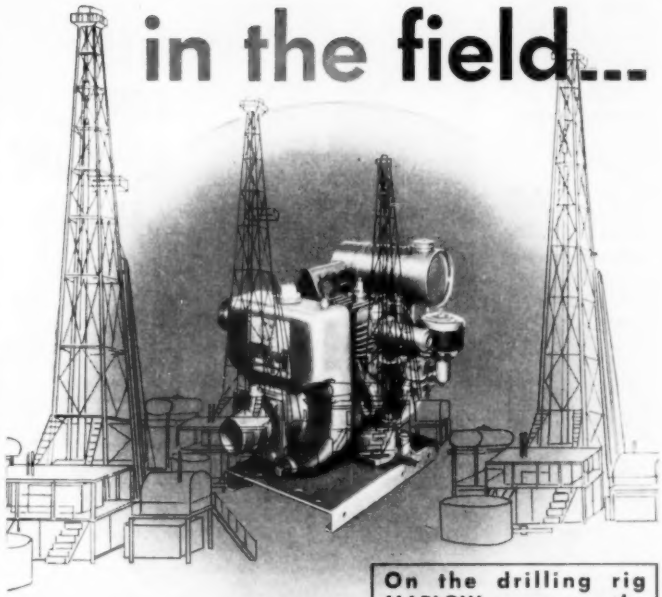
A. Aside from the more or less recognized considerations, such as the fact that drum end cuts are made on the basis of ton-miles of wire-line service and that the cutoff portion should be an even number of wraps plus one-half, we recommend the following:

First we recommend the purchase of longer drilling lines and the use of a tie-down drum on the deadline so that the line can be slipped through with a minimum of effort. For convenience in making drum-end cuts we recommend the use of a devise by which the block, hook, and elevator can be hung when new line is being brought into the system and the cutoff is being made. A practice must be avoided which will move the heavily worked sections directly onto another sheave with the blocks in the pickup position. Likewise, returning to points on the drum of original crossover on the second or third cuts must be avoided. Each cutoff formula worked out for particular rig conditions should have a 20 per cent increase in length of cut added as a safety factor.

Q. When making drum end cutoffs, are there any advantages realized if the rig is equipped with a controlled pyramid system grooving on the drum?

A. Yes, time is saved in line handling during the move forward and/or drum-end cutting-off procedure. Drilling crews using plain drums lose a great deal of time because of the difficulty of hand spooling the line after each drum cutoff is made. In many cases, rig operators have to lay the traveling

in the field...



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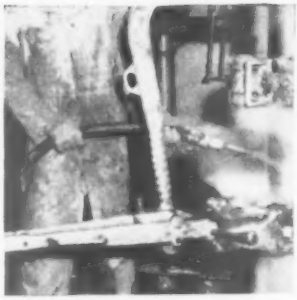

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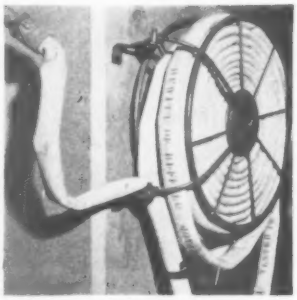

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block, hook, and elevator down several times after each cutoff to respool the line by hand and try to make it spool properly. Using the controlled pyramid spooling system, the line will automatically spool itself.

Q. What are other advantages of the controlled pyramid system of grooving?

A. One great advantage is that the operator uses only 8 to 15 wraps of line on the drum at the point where the pipe load is picked up on the rotary table. This results in a savings of from 100 to 250 ft. less line needed in the spooling system as compared to a plain drum where a complete layer plus several wraps on the second layer are employed.

Q. Earlier you mentioned turnback rollers and stabilizers. What are your specific recommendations on these?

A. As the line begins to wear down it has a tendency to force the line to stack up against the drum flange. Turnback rollers eliminate this, and in addition they help kick back the line for the correct crossover on successive wraps. This is always necessary, especially on jack-knife derricks which tend to throw a bad fleet angle on the line when it is being spooled on the drum.

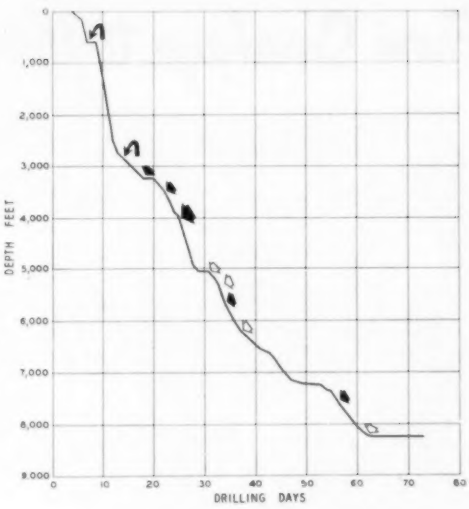
Wire-line stabilizers with properly controlled weight boxes are also necessary to help eliminate the effects of bad fleet angle and wire-line whip between the crown block fast sheave and drum hoist.

Q. What are your specific recommendations with regard to proper fleet angle?

A. In any hoisting layout it is extremely important that proper attention be given to the fleet angle since this factor influences the wire line and its ultimate good service. Through experience it has been shown that an excessive fleet angle may result in abrasion of successive wraps of wire line against each other and the rubbing of the wire line against the sides of the sheave groove. Also, excessive fleet angle will cause the wire line to wrap too close or too open on the first layer on plain drums, causing crushing and interlocking of succeeding layers. On the other hand, too small a fleet angle may cause the wire to pile up against the drum flange and then slip off.

Fleet angle is the side angle at which the wire line approaches the sheave from the drum. If an ungrooved drum is being used, it is important that the lead sheave be located at sufficient distance from the drum to maintain a small fleet angle at all times. Experience has proven that the best wire line service is obtained when the maximum fleet angle is 1½° for plain drums or 2° for grooved drums.

ANADARKO BASIN drilling problems as typified by the Sunray Oil Corp. discovery gas well in Harper County, Oklahoma, are discussed in this article. (Above).



DRILLING DIFFICULTIES encountered in making hole at Sunray Oil Corp. 1 E. M. Wolf are pointed out in the penetration curve at right. Curved arrows indicate where fishing jobs were cleaned up, hollow arrows where drilling mud was lost, and solid arrows where mud circulation was lost.

Straight-Hole Drilling in Lost-Circulation Zones

Kerr-McGee's rig for Sunray Oil Corp. stays within 2° on Anadarko basin test

by Joseph A. Kornfeld
Mid-Continent District Editor

STRAIGHT-HOLE drilling through lost-circulation zones is a recent feat by Kerr-McGee Oil Industries, Inc., Oklahoma City drilling contractor, on a 8,245-ft. discovery gas well in Harper County, Oklahoma. Deviation was held to less than 2° despite finding eight lost-circulation zones and two minor fishing jobs. An entire pit of drilling mud was lost in one zone.

Lost-circulation zones are common in the Permian and Pennsylvanian systems in the Anadarko basin of western Oklahoma and the Texas Panhandle. Proper mud treatment becomes of major importance.

Straight-Hole Drilling

The first 3,000 ft. of bore hole, principally in Permian red beds and shale, was drilled with a deviation of less than 1°. Weight on bit for this interval rarely exceeded 18,000 lb. although table speed averaged 95 r.p.m.

However, deviations in excess of 1½° were logged in the interval from 3,452 to 3,604 ft. in the Pennsylvanian system. Weight carried on bit ranged from 25,000 to 30,000 lb. in this interval while the rotary table was turned at speeds ranging as high as 85-90 r.p.m. Maximum deviation recorded was 2° at 3,452 ft.

This condition did not persist below 3,800 ft. and the remainder of the hole was drilled with deviations of only 1°.

The discovery well is 1 E. M. Wolf, located in the center of Lot 2, NW NE 4-25n-25w. This discovery lies 8 miles southwest of Stockholm Southwest field of the same county.

Rig Description

Kerr-McGee used its Rig 7 in drilling this well. This rig comprises a Model 75 draw works, powered by two six-cylinder LROU butane engines and one eight-cylinder RX 12. Mud pumps are one Model 14 PHD and a Model 218-P. Derrick is a 131-ft. 620,000-lb.-capacity mast with a 21 by 21-ft. base; it rests on a 9-ft. substructure with a 26 by 45-ft. base. A 20½-in. rotary table is used.

Casing and Cementing

Surface casing . . . A 15-in. hole was cut to a depth of 586 ft. in which the 13¾-in. 44-lb. surface pipe was set. It was cemented with 400 sacks containing 4 per cent gel, plus 100 sacks of Stratacrete after cementing was completed. Pressure of 400 psi. was maintained on casing.

At this point the surface shoe was drilled with a 12¼-in. bit and hole made to a depth of 3,127 ft. to set the intermediate string of 9⅝-in. casing. This string was cemented with 300 sacks plus 8 sacks of gel and 50 sacks of Stratacrete. Pipe was cut off at 3,115 ft.

Diamond Coring

Four diamond cores were cut in the Chester formation with 6-in. bits from 7,195 to 7,245 ft., as shown in Table 1.

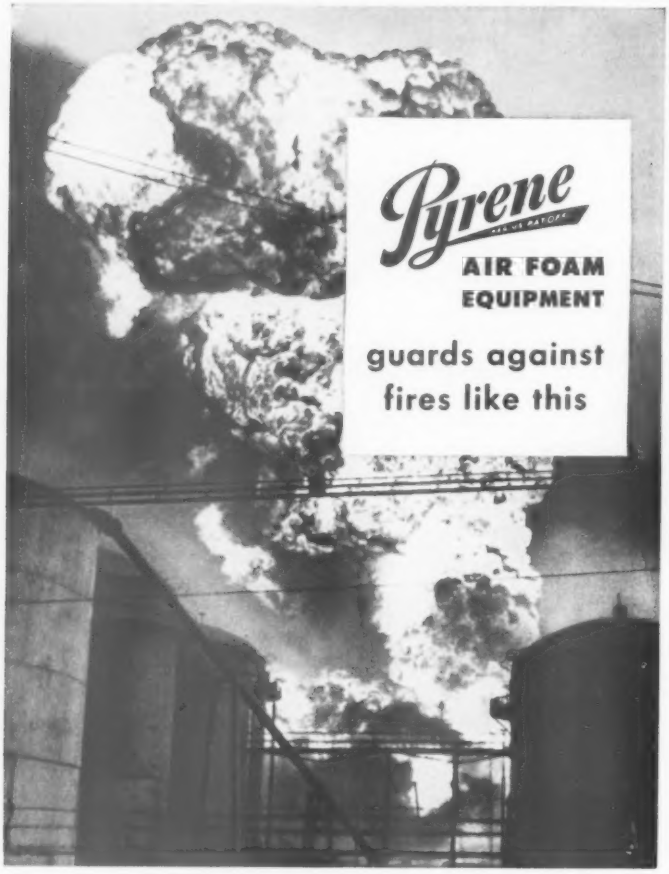
TABLE 1—SUMMARY OF DIAMOND CORING OPERATIONS

Bit No.	Depth range (ft.)	Bit weight (thousand lbs.)	Rotary r.p.m
1	7,195-7,202	5	65
2	7,202-7,204	8	70
3	7,204-7,208	10	60
4	7,231-7,245	10	60

The only fishing job encountered on this well occurred when a joint of surface pipe was dropped at 586 ft. The fish was recovered in 1½ hours.

Days to drill . . . Despite the numerous lost-circulation zones encountered in drilling this well, over-all drilling time from rigging up to tearing down was only 73 days to 8,245 ft. However, contract depth of 7,800 ft. was reached in only 58 days on this exploratory test, which included the cutting of four

From Surabaya to Maracaibo...



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IN THE SALT PLAINS of western Oklahoma, Kerr-McGee Oil Industries, Inc., used Rig 7 to drill 1 E. M. Wolf for Sunray Oil Corp. in Harper County.

diamond cores; thus, 15 days were expended on day work.

Long string . . . The cement plug on the intermediate string was drilled with an 8¾-in. bit and open hole was carried to a total depth of 8,245 ft. A final string of 5½-in. J-55 pipe was run to a depth of 7,315 ft. It was a design of mixed weights, comprised as follows:

17-lb.	1,015 ft.
14-lb.	1,013 ft.
14-lb.	5,267 ft.
Total	7,295 ft.

The lost string was cemented with 75 sacks, 4 per cent gel and 20 sacks of Stratacrete. Scratchers were run as high as 7,185 ft.

TABLE 2—MUD PROGRAM ON 1 WOLF

Depth range	Mud weight (lb./gal.)	Viscosity (Sec. A.P.I.)	Water loss (c.c.)
0-3,000	10.3-10.7	31-36	
3,000-5,000	8.9-10.5	35-44	
5,000-7,000	9.0- 9.5	37-65	8.8-11.2
7,000-7,250	9.1- 9.3	75-100	8.0
7,250-8,000	9.2	70	6.4- 8.4
8,000-8,245*	9.1- 9.3	75-90	6.8- 8.4

*Total depth.

The lost circulation was first observed at a depth of 3,200 ft. in the Permian

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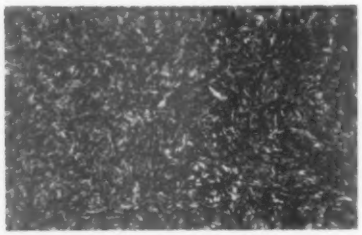

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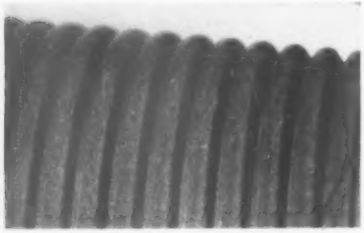

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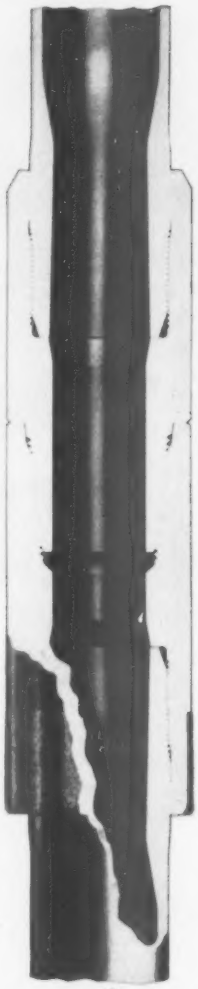

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system. However, circulation was quickly regained. The next lost-circulation zone was encountered at 3,504 ft. Additives for mixture used at this level were comprised of Magcogel 22 sacks, Tannathin 50 lb., and cotton-seed hulls 26 sacks. At a depth of 4,000 ft., lost circulation was bad and one pit of mud was lost. Other major lost-circulation zones and drilling-mud treatments are shown in Table 3.

TABLE 3—MAJOR LOST-CIRCULATION ZONES AND DRILLING-MUD TREATMENTS

5,330 ft.—Magcogel, 35 sacks; Tannathin, 100 lb.; soda ash, 25 lb.; caustic soda, 10 lb.
5,642 ft.—Magcogel, 50 sacks; Tannathin, 50 lb.; soda ash, 25 lb.; caustic soda, 5 lb.; cotton-seed hulls, 15 sacks.
6,176 ft.—Magcogel, 33 sacks; Tannathin, 50 lb.; soda ash, 25 lb.; caustic soda, 5 lb.; Magaphos, 25 lb.; cotton-seed hulls, 6 sacks.

Drilling data . . . Table 4 summarizes principal drilling data by intervals for both drilling and coring operations.

Morrow Sand Discovery

The discovery is important in that it lies along a regional exploration trend on the northeast limb of the Anadarko basin which has commanded Mid-Continent attention in recent years.

On initial completion the well tested 5.2 million cubic feet of gas through a 1-in. choke. From the separator, 47 bbl. per day of 68.2° A.P.I.-gravity distillate was recovered.

The producing formation is the Morrow sand of lower Pennsylvanian age. This section was gun-perforated from 7,190-7,230 ft. Well-head pressure initially registered 275 psig. on the tubing-head gage.

TABLE 4—DRILLING DATA—SUNRAY'S 1 E. M. WOLF

Depth range (ft.)	Formation	Bit wt. (1,000 lb.)	Table speed (r.p.m.)
Drilling Operations			
0-2,100	Red beds, shale	10-15	95
2,100-2,700	Red beds, shale	18	95
2,700-3,500	Lime and shale	25-35	60-65
3,500-5,000	Lime and shale	25-30	85-90
5,000-7,200	Lime and shale	25-30	65-72
7,200-8,115	Sandy lime	30	65
8,115-8,122	Chert	20	45
8,122-8,245	Chert and lime	30	60
Reaming* After Diamond Coring			
7,195-7,204		20	65
7,204-7,229		20	60
7,231-7,251		20	65
7,251-7,269		30	65

*All reaming conducted with an 8¾-in. bit in reaming out 6-in. diamond core hole.

Acknowledgment

The writer expresses thanks to George B. Kitchel, vice president, Kerr-McGee Oil Industries, Inc., and to Alvin Summers, Oklahoma district superintendent, Sunray Oil Corp., both of Oklahoma City.

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Improved Rock Bit Lowers Drilling Cost . . .

. . . in hard, abrasive formations

by Lyle L. Payne

IN recent years search for deeper producing zones has introduced the serious problem of penetrating extremely hard and abrasive formations. Typical examples are the Devonian chert of West Texas or the bromides of Oklahoma. These formations cannot be economically drilled without applying adequate load on the bit to establish a destructive chipping-crushing action as the cutting surfaces rotate on bottom.

The problem of fortifying the cutting and gage surfaces of rolling-cutter rock bits better to withstand abrasive wear encountered in many formations has been recognized since 1909. From then until 1929, rock-bit manufacturers depended entirely upon a carburized cutter to resist abrasive wear encountered in rotary drilling. Although periodic improvements in design materially increased the footage per bit and penetration rate, the abrasion problem was still unsolved.

During 1929 granulated cast tungsten carbide was first applied to the flanks of cutter teeth and the gage cutting surface. This material is extremely hard and highly resistant to abrasive action. Rock bits having an overlay of cast tungsten carbide applied to the cutting surfaces recorded marked improvement in performance, particularly in drilling abrasive formations of medium to low strength. The advent of tungsten carbide, in combination with improved metallurgy, alloy steels, and design, has been a major factor in the widespread use of rotary drilling.

The cast tungsten carbide application on the tooth flank of hard formation rock bits, such as the W7R, is not effective in drilling extremely hard, abrasive materials which require heavy weight applied on the bit. Although this form of carbide is extremely hard and resistant to abrasion, it is also very brittle. This latter physical property limits its effectiveness as a protective overlay on hard formation rock-bit cutter teeth when drilling formations under consideration.

Sintered tungsten carbide has been used on metal-cutting tools for many years. This material is almost as hard as the cast carbide, and has the desirable property of being much less brittle than the cast form. Recognition of its great resistance to abrasion and its compressive strength in excess of

LYLE L. PAYNE
Chief engineer, Hughes Tool Co.

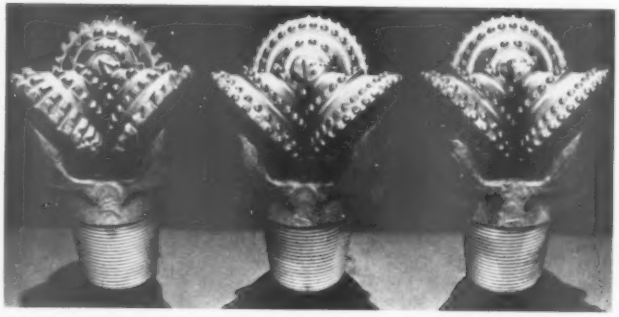
500,000 psi. justified an extensive research program to utilize sintered tungsten carbide for rock-bit cutting elements.

During the past 12 years numerous attempts were made to use the sintered form of carbide on rock-bit cutters. The carbides available during most of this period did not have the physical properties required for successful application on rolling-cutter rock bits. Over the past few years sintered carbide manufacturers have developed remarkably tough grades for sustaining high-impact stress and still retaining high resistance to abrasion.

The above program, spurred by the desire of reducing the high cost of drilling chert, chert-bearing lime or dolomite, and hard, quartzitic formations, has led to the development of the Hugheset Type R-1 rock bit. This new bit has three conical cutters studded with hemispherical-ended cylinders of sintered carbide. The application of carbide cutting elements as represented by this bit has been field proven over the past 2 years.

Cherty Sections; Quartzitic Formations

The R-1 bit has given remarkable performance in the hard, abrasive,



8¾-IN. BITS AFTER CUTTING WEST TEXAS CHERT

This photo and table show bit performance record of a well drilled in Upton County, West Texas. The formation was Devonian lime and chert.

The three bits listed in the table are shown in the photo. The cutting teeth and gage surface of the W7R (left) had served their useful life. The bit is well worn.

The new R-1 bits (center and right) show moderate carbide breakage, but no appreciable wear off those compacts which are not chipped or broken. The R-1 bits were pulled on the basis of relatively long rotating hours.

The two runs of the new R-1 bit, compared to the W7R, established a remarkable average footage ratio of 15 and a penetration speed ratio of 3.2.

Photo—	Type	Depth	Feet	Hours	Ft.-hr.	Net	R.p.m.
Left	W7R	11,789	8	6½	1.23	35,000	40
Center	R-1	12,922	133	31	4.29	40,000	35
Right	R-1	13,030	108	30	3.60	35,000	35

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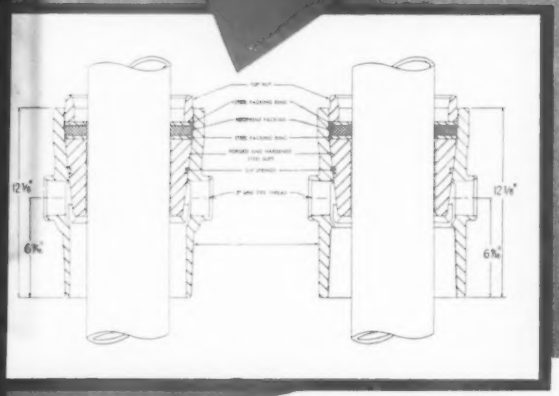

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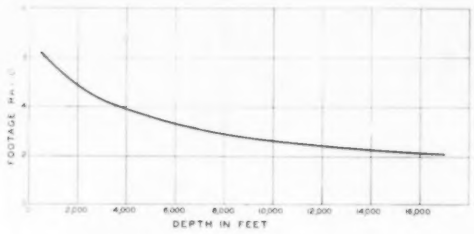


Fig. 1—This curve shows the footage ratio required of the R-1 to equal a regular bit's cost per foot, for various depths. In calculations, round-trip time was taken on 0.8 hour per 1,000 ft., rig cost time at $50 per hour.

cherty sections of West Texas and New Mexico, and the hard quartzitic formations of Oklahoma and the Rocky Mountain areas. It is not unusual for one R-1 bit to drill 3 to 10 times the footage normally obtained with regular hard-formation rock bits in these hard, abrasive formations. The drilling rate will equal that of regular bits, and in some cases has exceeded the rate of regular bits by 50 to 100 per cent.

The R-1 may be called a "spot" bit, but its application has been very rewarding in those localities where the spots are fairly well established. Experience has shown that not all formations classified as "hard abrasive," in which regular bits give relatively short runs, are economically drilled by the Type R-1. Certain sandstones, which have relatively weak binders, and some hard, abrasive shales have not responded to the crushing action of the R-1 cutting structure. Apparently these formations, in place, must be somewhat plastic and are not friable. Field tests are necessary in determining the suitable formations for the R-1.

Tables 1, 2, and 3 were compiled from bit-performance records and show the average performance of the R-1 compared to the regular W7R.

Referring to Table 1, the average of 128 R-1 bits run and 89 W7R bits run in the same formation shows that R-1 has a footage ratio of 4.1 and a penetration ratio of 1.1. Table 2 lists a limited number of runs. However, the R-1 footage ratio is 3.6, and the speed ratio is 1.1. Table 3 lists comparative runs made in Oklahoma, and the average R-1 footage ratio is 2.9. The speed ratio is 1.4.

Operating Conditions

It has been found that the best operating practices in drilling chert or chert-bearing limestones is to carry weight on the bit of approximately 4,000 lb. per inch of bit diameter, with a rotary speed of approximately 35 r.p.m. Extremely heavy weights in the range 5,000-6,000 lb. per inch of bit diameter are not necessarily economical.

Weight applied on the R-1, in excess of that required to establish effective chipping-crushing action on the formation, may materially reduce bearing life and also cause more breakage of the sintered compacts. A compromise applied load and a relatively slow rotary speed will normally establish very smooth operation of the bit, which is highly beneficial to long bearing life, and consequently results in more footage per bit. The sintered carbide wears at a very slow rate and will maintain the initial penetration rate over a long period. Apparently only enough weight on the bit effectively to crush the formation is an optimum practice.

In certain instances the R-1 has been used in drilling a cherty dolomite with an applied bit load in the range 500-1,000 lb. per inch of bit diameter. The R-1 footage ratio and speed of penetration ratio, compared to the W7R, were very satisfactory.

In some cases it may be necessary to ream an undersized hole before reaching bottom with the R-1. Such reaming should be performed under careful control to avoid imposition of large inward thrust forces which may cause breakage of the gage-cutting, sintered compacts. It is recommended that reaming be performed at a control rate and not exceed 10 ft. per hour. Furthermore, it is advisable to periodically check the applied torque by disengaging the rotary table drive clutch. Excessive "wind up" of the drill stem indicates the bit is not reaming freely, and the drill stem should be raised to permit rereaming at a slower rate. In reaming an appreciable footage of extremely hard, abrasive formation the bit may become undersized and would, upon reaching bottom, drill undersized hole. Such cases may warrant a round trip to change bits in order to drill ahead with a full-gage bit.

The greater footage obtained in suitable formations has paid handsome dividends by reducing round trips, thereby saving rig time and wear on equipment. The curve shown in Fig. 1 will give an appreciation of this result. Under the assumed conditions, the footage ratio required of the R-1 to equal a regular bit's cost per foot of hole drilled at various depths, was calculated. A brief study of this curve shows the R-1 will lower drilling cost in suitable formations even at moderate depths, but particularly in deep drilling.

RECORDS OF BIT PERFORMANCE

TABLE 1—WEST TEXAS AND NEW MEXICO

Size bit (in.)	Bit type	No. bits run	Total footage	Total hours	Average ft. per bit	Average ft. per hr.	Ratio of footage	Ratio of speed
7⅞	R-1	9	442	162.75	49.11	2.72	5.0	1.6
7⅞	W7R	9	88	52.00	9.78	1.69		
6⅝	R-1	2	104	56.75	52.00	1.83	5.5	1.5
6⅝	W7R	2	19	16.00	9.50	1.19		
6¾	R-1	14	809	309.83	57.79	2.61	4.0	1.1
6¾	W7R	12	174	70.50	14.50	2.47		
8½	R-1	2	105	38.75	52.50	2.71	6.6	1.9
8½	W7R	1	8	5.50	8.00	1.45		
8¾	R-1	101	7,695	2,863.25	76.19	2.69	4.1	1.0
8¾	W7R	65	1,245	464.75	19.15	2.68		
All sizes	R-1	128	9,155	3,431.33	71.52	2.67	4.1	1.1
All sizes	W7R	89	1,534	608.75	17.24	2.52		

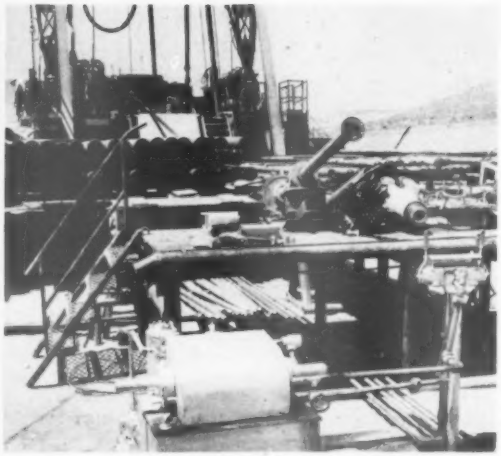
TABLE 2—ROCKY MOUNTAIN

Size bit (in.)	Bit type	No. bits run	Total footage	Total hours	Average ft. per bit	Average ft. per hr.	Ratio of footage	Ratio of speed
9	R-1	4	162	43.50	40.50	3.72	3.6	1.1
9	W7R	3	34	10.50	11.33	3.24		

TABLE 3—OKLAHOMA

Size bit (in.)	Bit type	No. bits run	Total footage	Total hours	Average ft. per bit	Average ft. per hr.	Ratio of footage	Ratio of speed
9	R-1	11	530	229.78	48.18	2.31	2.9	1.4
9	W7R	11	183	106.76	16.64	1.71		

To reduce fire hazard when gas or oil is encountered in a drilling well, California safety laws require all engines operating within 50 ft. of well be equipped with flame arresters and water-cooled exhausts such as is shown on this rig of Pike Drilling Co.



California's new safety orders contain detailed instructions as to the use of blowout preventer. One of the recommended locations for the master controls is at the far end of the pipe rack walkway, as shown at this Belgian Anticline well. (Same rig as left.)

WHICH ? . . .

More Regulations—or Better Safety Training?

Many contractors feel that the way to improved safety is through better education of crews as to hazards involved, and not through additional state regulations

by D. H. Stormont
West Coast District Editor

CALIFORNIA'S safety orders governing oil-well drilling have not reached the stage that the industry cannot effectively and efficiently conduct its operations. There is a growing feeling on the part of the state's leading drilling contractors, however, that the state's safety laws are quite ample; that any further reduction in work injuries will not be accomplished through additional regulations.

Rather, they believe, the answer lies in better education of crews as to the safety hazards involved in drilling and how to work safely under these conditions.

Primary reason for this belief is that regulations, for the most part, deal with physical facilities, "things," and not with people and their work habits. But studies by oil companies and colleges show that approximately 85 or 90 per cent of all industrial accidents are caused by people and not by things. Thus adoption of more rigid safety regulations will not materially reduce work injuries.

One of the biggest dangers of the state's recently revised regulations is that the multiplicity of detailed requirements for "things" and methods make it impossible for management to know they are always "furnished" or followed. No responsibility is placed on workers. The employer will be "negligent" for every accident and subject to law suit.

That California's safety regulations governing oil-well drilling are the most comprehensive and rigidly enforced of any oil state is generally accepted throughout the industry. Its safety orders were used as models in several oil states and currently are being considered by Canada and North Dakota in the promulgation of their petroleum safety codes.

Further evidence as to their excellence is reflected in 1952 workmen's compensation manual rates for drilling operations in the various oil states. In Texas the basic rate per $100 of annual payroll is $7.80, in Oklahoma $8.74, in New Mexico $8.08, and in Louisiana $5.89. California's rate this year is $5.79 per $100 payroll, about half what it was 20 years ago. Only in Kansas and the Rocky Mountain states are this year's manual rates lower.

Because of their recognized stature and the tendency for them to be adopted in other oil states, one contractor declared the entire industry should watch developments in California's safety orders. Prime reason for this, he added, is:

"With the state's laws tending to creep into those of other oil states, any burdensome requirement in California's code may have to be faced by a contractor later in another state. Thus whether or not he is operating in California, a contractor should assist in seeing that unwise provisions are not adopted here."

California is one of the few states that has set up separate safety orders for oil-well drilling and production. Originally adopted in 1924 and modernized in the past year, these orders supplement general industrial safety orders.

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SEE PAGE 266

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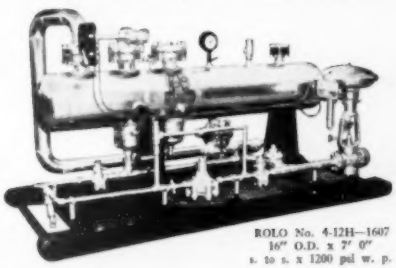

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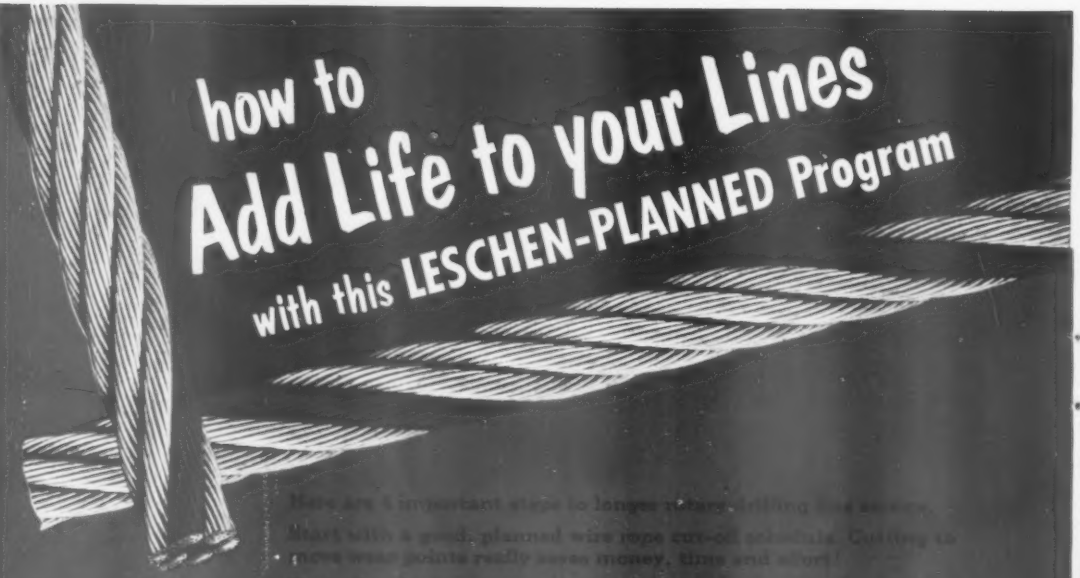

Here are 4 important steps to longer wire rope drilling line service.

Start with a good, planned wire rope cut-off schedule. Cutting to move wear points really saves money, time and effort!

Basically, the big question is how much to cut, and when. Before you follow average chart figures, always consider your drilling conditions, condition of your equipment, and your methods of operation. Judgment of the driller may frequently alter a "good" chart. The primary purpose of a chart is to *help the driller use good judgment.*

1. SAVE with a planned cut-off schedule

ROTARY DRILLING CUT-OFF CHART

Line Size	Drill Pipe Size	Excess Wgt. in 1000 Lbs.*	Approx. Length to cut in ft.**	Ton Miles to Cut	Trips per cut by depth									
					to 4,000	to 5,000	to 6,000	to 7,000	to 8,000	to 9,000	to 10,000	to 11,000	to 12,000	12,000 & deeper
1	3½	15	25	500	14	10	8	6	5	4				
1⅛	3½	20	30	1000	23	17	14	10	8	6	4	3		
1¼	3½	25	35	1100	32	20	16	11	8	7	4	3	2	
1	4½	25	25	500	10	6	5	4	3	2				
1⅛	4½	30	35	1000	16	10	8	7	6	5	4	3	2	2
1¼	4½	30	40	1000	24	15	12	9	7	5	4	3	2	2
1¼	4½	50	40	1100	15	10	8	6	5	4	3	3	2	2

*Excess weight includes entire hook load less weight of drill pipe.
**On conventional drum sizes.

To maintain a good cut-off schedule, you need a line long enough to permit cutting. Given that, cut as soon as wear becomes evident. Don't wait for breakage of wires. The length of each cut depends upon drum diameter. You should figure at least four or more even numbers of drum wraps, *plus* one full wrap. Use the chart, *and use good judgment.* And always be sure heavily worked portions of the rope are not returned to critical wear points on drums and sheaves.

Spool your rope evenly and tightly on the drum. If necessary, install a rope strip or spooling wedge to fill the gap at the side of the drum.

FREE Additional copies of this valuable 3-way chart, plasticoated and punched for hanging, are available. Get your free copies from your Leschen representative or distributor—or write.

2. CHECK hook loads for better service

Line	Approximate MAXIMUM HOOK LOAD in Pounds						
	1 Part	2 Parts	4 Parts	6 Parts	8 Parts	10 Parts	12 Parts
1"—Wire Rope Core	17,960	34,480	63,860	88,570	109,180	126,190	139,980
1⅛"—Wire Rope Core	22,600	43,460	80,360	111,450	137,390	158,790	176,150
1¼"—Fiber Core	25,840	49,690	91,880	127,430	157,090	181,550	201,400
LEAD LINE Pull Factor	——	.5200	.2812	.2027	.1645	.1423	.1283

Lead line pull factor x load lifted = Tension on lead line.

3. WATCH breaking strengths for greater safety

SIZE	6 x 19		6 x 37	6 x 7
	Fiber Core	Wire Rope Core	Fiber Core	Fiber Core
⅜	6.10 .23	6.56 .25	5.77 .22	
7/16	8.27 .31	8.89 .34	7.82 .30	
½	10.70 .40	11.50 .44	10.20 .39	10.30 .38
9/16	13.50 .51	14.50 .56	12.90 .49	13.00 .48
⅝	16.70 .63	17.90 .69	15.80 .61	15.90 .59
¾	23.80 .90	25.60 .99	22.60 .87	
⅞	32.20 1.23	34.60 1.35	30.60 1.19	
1	41.80 1.60	44.90 1.76	39.80 1.55	
1⅛	52.60 2.03	56.50 2.23		
1¼	64.60 2.50	69.40 2.75		

BREAKING STRENGTHS—In tons of 2,000 lbs.

4. USE the right rope for the job

Line	Wire Rope Construction	Core	Type	Grade
Rotary Drilling	6 x 19 Seale	Fiber or Wire Rope	Preformed Preferred	HERCULES® Red-Strand
Bailing and Sand Line	6 x 19 Seale	Fiber	Preformed	HERCULES® Red-Strand
Core Barrel and Bailing Lines	6 x 7 Bright or Galvanized	Fiber	Preformed	HERCULES® Red-Strand
Tong Lines	6 x 19 Filler or 6x37 Seale	Fiber	Preformed Preferred	HERCULES® Red-Strand

APPLICATION RECOMMENDATIONS

LESCHEN WIRE ROPE

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production, effective last June 13, was adopted by the Industrial Safety Board after a committee of industry, labor, and industrial safety representatives had thoroughly studied proposed changes and after public hearings on the changes had been held in San Francisco and Los Angeles.

While the revised regulations were being studied, California contractors argued against certain proposals being written into the code. The dissensions centered chiefly around recommendations as to the use of wire rope spinning lines, need for individual lockers, first-aid personnel needed at a rig, and use and location of blowout preventers. For the most part the contractors were successful either in having the proposed changes modified or eliminated.

They also argued against the practice of adopting manufacturer's recommendations as to the use of their equipment. This was because of, as one drilling executive expressed it, the dangers and hardships which could result from "manufacturers' catalogs being framed into law."

Manufacturers recommend practices and conditions which will result in their equipment giving the longest and most trouble-free service, with large factors of safety included. While these recommendations are taken into consideration in using the equipment, contractors believe they should be free to use their equipment as they see fit.

Rough usage and overstrain may result in the equipment not giving the service life it is supposed to, but if a contractor's experience has been that he can drill more hole through such practices, and without violating normal safety precautions, he wants to do so without being charged with the violation of safety orders.

Inclusion of the requirement that wire rope be used according to manufacturer's recommendation has resulted in a situation where it is impossible to drill a well below 8,000 or 9,000 ft. if the state's code is interpreted as it might be. Without going into detail, this stems from recommendations as to the minimum size drum to be used with drilling lines of certain diameter. Draw-works drums currently available are not large enough to comply with the minimum size recommended.

Another proposed requirement pertained to spinning lines—chain spinning lines would not be permitted. Contractors who for years have preferred chain over manila rope use it because they believe the former is safer. Or at least it is not more dangerous.

With manila rope the crewman must step up on the rotary housing and with his hands move the wraps upward onto the joint to be spun. On a slippery floor this movement could result in an accident. With chain the crewman can flip the wraps onto the joint without having to move forward.

After much discussion, wordage of the proposed change was revised to the extent that chains can still be used.

Another provision of the revised orders is that individual lockers must be provided each crewman. Some contractors claim their men do not want their clothes kept in lockers; do not like the necessity of having to carry keys. The provision was kept in the final orders, however, and currently citations are being issued for its violation.

While the revised orders were under discussion, contractors with rigs requiring five-man crews feared they might be faced with more rigid first-aid requirements. These, however, were unchanged insofar as the availability of a "qualified" person to administer first-aid and artificial respiration in the event of an injury is concerned.

Detailed specifications as to the use and location of blowout preventers are included in the revised order. These

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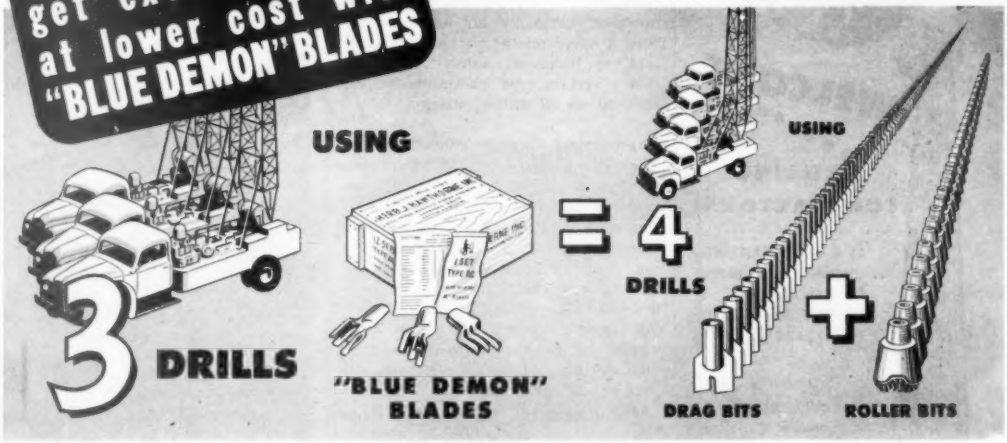

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specify that where a well is being drilled and the presence of oil and gas is unknown, or in a field where high pressures are known to exist, the well shall be equipped with blowout prevention equipment. In the main, contractors agree with requirements as contained in the orders. They are, however, decidedly out of sympathy with a move on the part of the Division of Industrial Safety to require that a certain type blowout preventer be used on all drilling wells.

Improvement through education . . . That the accident record of drilling contractors can best be made through adequate safety training programs is shown by the records of large West Coast companies which operate drilling rigs. Through their several-man safety departments, safe working is stressed much more than by the average drilling contractor. These companies, for the most part self-insurers, annually have far better safety records than drilling contractors.

Experiences of General Petroleum Corp., which self-insures workmen's compensation risks, furnish an excellent example of what can be accomplished when management sets its mind to reduce work accidents. In 1947 the company's accident frequency was 10.79 per million hours worked. In 1948 it was 5.88; in 1949, 6.25; in 1950, 4.19; and in 1951, 2.55, the lowest in the company's history. The over-all rate of 184 oil companies last year was 10.07, four times as high.

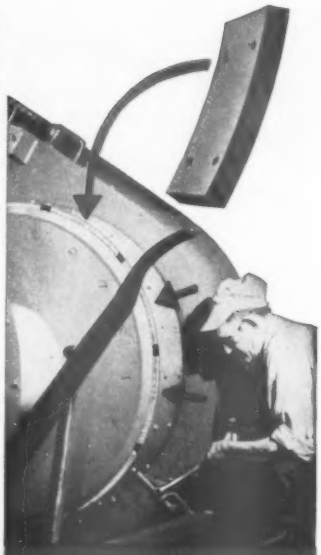
In 1951, according to R. L. Minckler, president, General Petroleum's company-wide costs were 19.1 cents per $100 payroll.* The production department cost was 36.4 cents per $100 payroll, compared with state manual rates of $5.79 for oil-well drilling and $1.75 for oil producing.

Drilling contractors with low accident experiences, of course, are given rebates of 50 per cent or higher so that their true costs are in the order of $2.50 or $3.00.

Recognizing that management is the agency primarily responsible for spirit and attitude, Minckler laid down the following four rules for management's role in a successful safety program:

1. Management must really believe in the importance of industrial safety.
2. Management must recognize that an industrial safety program will have to satisfy pressures from Government, customers, employes, shareholders, and the general public.
3. Management must recognize its

*"Safety, a Real Challenge to Management," by R. L. Minckler before the Greater Los Angeles chapter of the National Safety Council, March 17, 1952.



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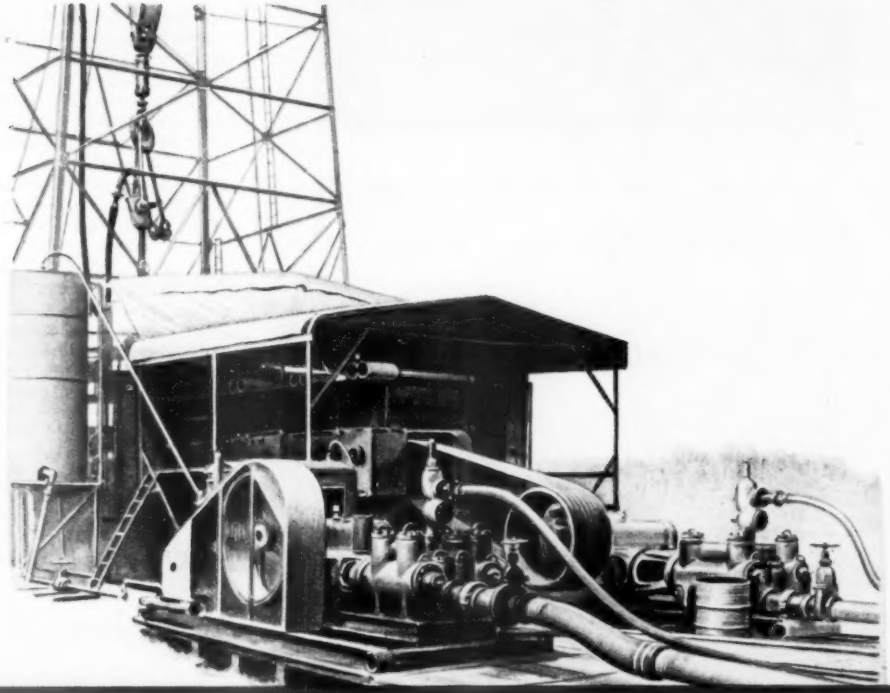

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responsibility for the development of spirit and attitude at all levels of management.

4. Management must live as it preaches by providing funds for adequate safety personnel and adequate safety training procedures, and adequate safety equipment.

Further insight into the reasons for General Petroleum's success in accident prevention is offered in the accompanying brief address made by the company's safety director, J. H. McKenzie, before this year's Western Safety Conference. Approached from this viewpoint, and with the support of management, safety records undoubtedly will be improved much more than could ever be accomplished through regulations.

Safety Must Be Sold—As Well As Engineered

by J. H. McKenzie*

I HAVE given this safety business a lot of thought and in a lot of ways much of it I do not yet understand, but one thing I have found that faces all of us and that is after an organization has reached a certain point in the reduction of accidents, it seems impossible to go any further. It was apparent that in time our company would be in this predicament.

The thought didn't seem to have any appeal and so I started talking to people in our company—people who had been successful in the growth of our company, people who keep our company growing and in good favor with the public. This talking went on for quite a spell . . . then I resolved this talking into eight thought sequences each. Here they are in briefest form:

1. For a long time safety men have been trying to associate their work with engineering work. They have striven to be known as "safety engineers."

2. This in the past was a logical and worth-while effort, since a lot of their work involved the engineering of better methods, better facilities and better equipment with the end view of producing a safer working place.

*Manager of safety department, General Petroleum Corp., Los Angeles. Presented at fourteenth annual Western Safety Conference, June 16-18, 1952, Long Beach, Calif.

3. That era of safety in most companies has now become a secondary consideration. Safety men will always have to watch physical facilities to avoid hazards, but they have a new and larger responsibility today, if their safety work is going to be ultimately effective.

4. Safety men are going to have to recognize, much as they may dislike it, that they are basically "idea salesmen." The safest facility in the world cannot produce an outstanding safety record if the people in the plant are not "safety minded."

5. Indeed, whether they have recognized it or not, safety men have had to be salesmen because every expenditure of money for better and safer plant facilities has involved some "selling" on behalf of safety men.

6. The establishment of safety mindedness cannot be achieved by engineering methods. You cannot engineer a man's brains. There have been a few outstanding examples of good salesmanship by safety directors, but most of the selling propaganda and the selling devices developed in the safety field leave much room for improvement. (Compare safety posters with commercial 24 sheets. Compare the average safety activity with the average activity put on by an advertising agency on behalf of a commercial product. Compare the publicity given safety achievements with publicity given other organizational activities.)

7. So, let us in the safety business, for a while at least, put aside our engineering text books and our slide rules and start studying the techniques of other people engaged in selling ideas. Let's recognize that idea selling is every bit of a special problem as being a slide-rule jockey. Let's seek out the salesmen, the advertising men, the show men, and the promotion men in our fields. Let's ask their advice on "How to sell our basic proposition—Safety." Let's find out how they sell their ideas to different groups with which, we too, must deal—top management, middle management, foremen, workers, civic officials, bureaucrats, and the general public.

8. Let's identify ourselves with idea selling, just as thoroughly as we have identified ourselves with engineering in the past. If we do this, we will multiply our effectiveness a thousandfold and we can put safety in the front of the minds of everyone in industry. If we don't, we are going to hit the inevitable ceiling that we all are aware of, when safety records just can't be improved by spending more money on better working facilities and better engineering.

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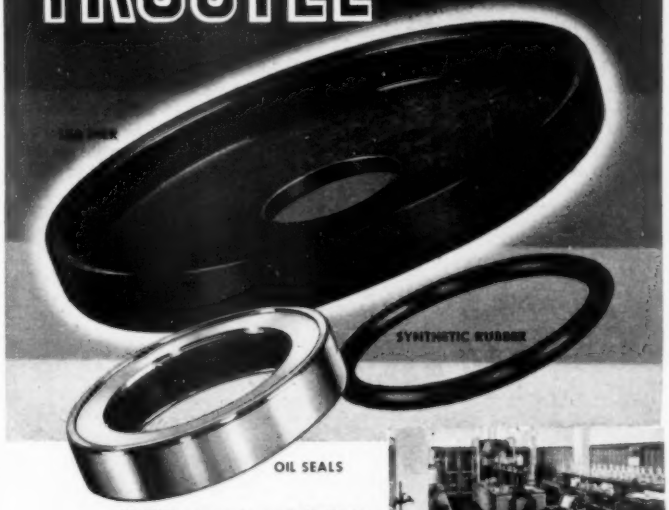

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New Bit Speeds Drilling in Hard and Brittle Formations

by E. G. Boice*

A CRUSH-TYPE hard formation bit known as the "Cobra" in extensive field tests has consistently given from four to eight times the footage of conventional bits, when drilling extremely hard and brittle formations.

This development is a special-purpose bit, designed for very brittle formations with a high compressive strength. However, it is not a cure-all. Conventional rock bits will, generally speaking, drill a wide range of formations satisfactorily but current field experience with the Cobra has shown that, as the formation becomes softer, rate of penetration drops off rapidly. In broken formations the bit has a tendency to run "rough."

Tungsten-carbide inserts speed up drilling rates of Cobra bit.

Instead of conventional teeth on the cutters, the Cobra has a series of tungsten carbide inserts imbedded in smooth rollers. The contact surfaces of these inserts are spherical in shape.

Performance Data

The bit is as unconventional in performance as it is in appearance. This fact becomes apparent when one considers these conclusions that have been derived from experience gained in extensive field tests:

Footage per bit . . . In West Texas chert formations (30 per cent chert content or better) the Cobra is found to drill from four to eight times the footage of conventional hard formation bits. In laboratory tests on still harder formations such as pink quartzite (compressive strength from 50,000 to 60,000 psi.) it was found that the bit would drill 15 to 20 times as much footage as conventional bits.

Rate of penetration . . . This was about 3 to 4 ft. per hour in West Texas chert formations with the drilling rate falling off in softer formations.

The rate of penetration, in the same formation, remains substantially constant throughout the life of the bit. Since rate of penetration does not fall off with bit wear, some form of torque indicator is needed to tell when the cutter bearings are becoming worn. It should be pulled whenever the torque rises appreciably.

Drilling weights and r.p.m. . . . Field

*Director of research, Reed Roller Bit Co., Houston.

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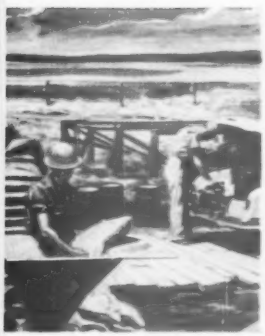

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Kobe, Inc., Division, *Huntington Park, Calif.* Complete hydraulic oil field pumping systems, including the Kobe Free Pump.

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Individually or collectively, the Dresser group works in all its divisions helping to expand oil and gas facilities to meet the world's ever-increasing energy requirements. It is this planned association of companies and products that gives breadth and depth to Dresser's combined operations. This integrated line of equipment and coordinated service enables Dresser Industries to make *your* job easier and better.

Magnet Cove Barium Corporation provides the oil industry with a complete drilling mud service. In addition to mining and processing a variety of specialized drilling mud materials, Magcobar has an expansive dealer organization, a large staff of experienced field mud engineers who travel in laboratory-equipped cars and are backed up by modern research facilities. Magcobar developed and pioneered the flotation process to beneficiate barite. This and other of the company's advanced techniques have added millions of tons of barite reserves and have saved millions of dollars for the oil industry through lower costs.

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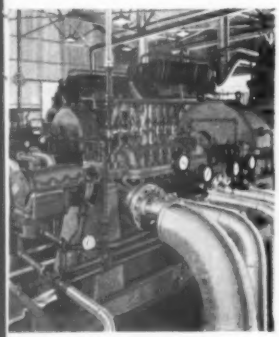

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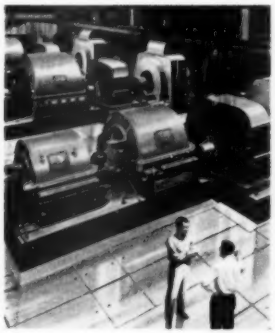

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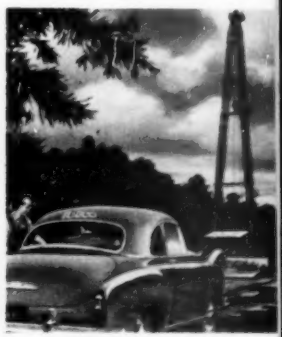

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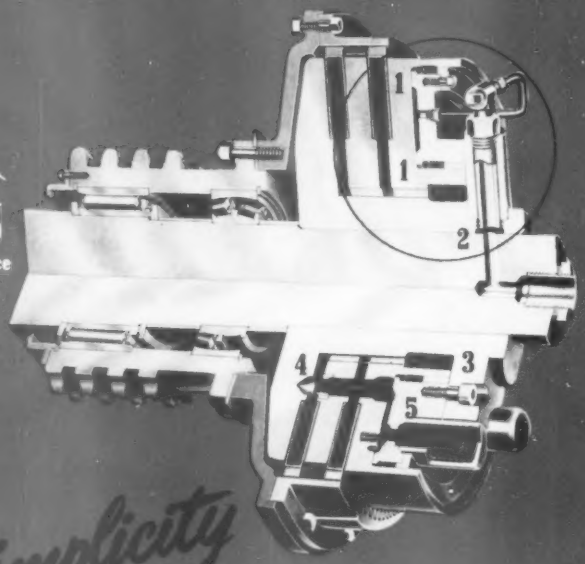

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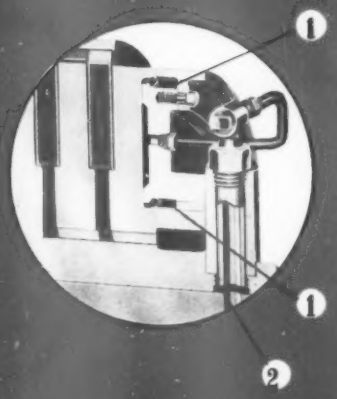

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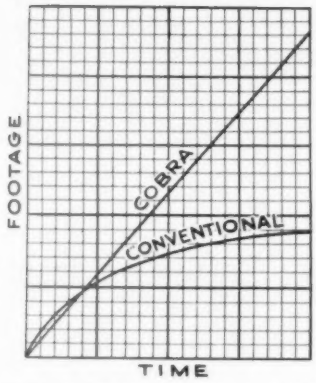

Relative drilling rates, Cobra vs. conventional bit.

experience with bits in the 8¾-in. size range indicates that weights of 25,000 to 35,000 lb. are adequate. This is somewhat less than the weights required for conventional bits.

Relatively slow rotary speeds of 30 to 50 r.p.m. seem to give best results. It is believed that slow rotary speeds give the fluid time to clean the bottom of the hole, thus avoiding recycling of cuttings.

Circulation requirements . . . Best results and longest runs have resulted when bottom-hole circulation, such as that obtained with "Twin-Blast" slush nozzles, is used.

In this connection it is important to pump enough fluid to maintain the high nozzle and return annulus velocities required to keep the bottom of the hole free from cuttings.

Geological Considerations

Tests have indicated that penetration characteristics of the new bit are the reverse of those found when running conventional bits; that is—the harder the formation, the faster it drills. Unless a geologist is warned, he may erroneously conclude that the bit is striking a softer formation when actually it has encountered a harder, more brittle one.

It is too early to draw any firm conclusion regarding the economics of running Cobra bits but tests indicate that where thick streaks of hard, brittle formation are encountered, there is a substantial economy in round trips and drilling time. It is believed that bit costs per foot will be comparable to conventional bits in spite of the high first cost of the Cobra bit, since each bit gives so much more footage. Many round trips and much rig time are saved, thus effecting an over-all economy in drilling costs.

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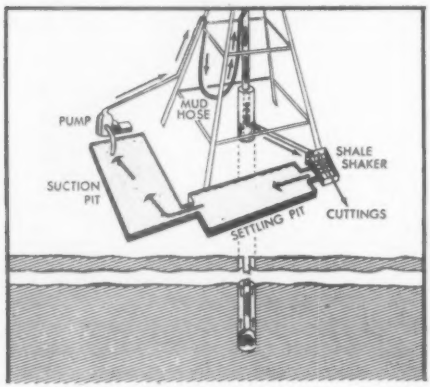
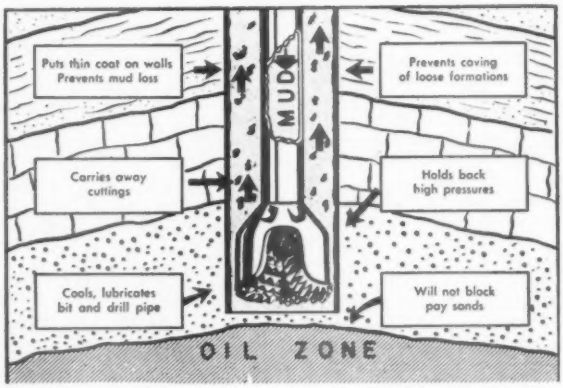
Drilling Muds . . .

WHY THIS SUBJECT? — One of the answers might be seen in the importance the industry now attaches to "drilling muds." Recently the director members of A.A.O.D.C. were asked what developments have made possible modern-day drilling to maximum depths. Replies received from well-known experts listed drilling muds as first-order business.

. . . A Symposium





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Here's how an industry developed . . .

ROTARY DRILLING FLUIDS—

Yesterday . . . Today . . . and Tomorrow?

by E. W. Louden*

THE relative success of every drilling operation depends directly upon the properties of the drilling fluid employed. It may vary from a simple mixture of native earth minerals and water to a very complex, closely controlled fluid compounded with special clays, heavy minerals, organic colloids, and soluble organic and inorganic chemical compounds.

The more complex drilling-fluid systems may employ a liquid phase of water, water-in-oil emulsion, oil-in-water emulsion, or oil. These complex fluids have been developed to increase the drilling efficiency necessary for the drilling of today's deep holes. Harmonious cooperation among research, development, and practical field application will continue to increase the knowledge necessary quickly to overcome future problems of drilling-fluid design.

This discussion traces the technical and practical development of drilling fluid. It will be well to remember that the early rotary drillers were venturing into an entirely new field. Most of their treatments were of the trial-and-error variety coupled with direct observation of the results. It was some time before even the simplest reproducible tests for drilling fluids were developed.

The first rotary drilling fluid was water. Its functions were to transport the bit cuttings to the surface and cool the bit. Water was admirably suited for these purposes and in addition has proved to be the fluid which least retards drilling rate.

Clear water remains the ideal drilling fluid where no other function must be performed. Such use is almost entirely confined to making hole through

*Manager Field Service Engineering Department, Baroid Sales Division, National Lead Co., Houston.

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hard rock formations, having very low permeabilities which do not slough, swell, or promote the deposition of a filter cake.

Most rotary wells have been drilled through formations which may be unconsolidated, made up of hydratable shales, highly permeable sands, gravels, and limes. They may also contain fluids or gases which may migrate into bore holes containing only water or may require protection from drilling water migrating into them.

One of the first observations made was that less hole trouble was encountered as this drilling water became muddy with ground-up formation clays. The immediate application of this observation was to allow a native mud to build up and to add local surface clays to the drilling fluid. This muddy slurry was described as a drilling mud and since the term "mud" remains in common use all drilling fluids will be called "mud" in the remainder of this discussion. The use of formation and surface clays was the first step in which **colloids** were intentionally put to practical use. The early drillers did not know that these clays contained colloidal fractions. The very use of the word would probably have precipitated an involuntary head-first plunge into the mud pit by the user.

In a relatively short time men with scientific knowledge of colloids and their behavior observed the use of common clay muds and deduced the reasons for their increased efficiency over plain water. This was followed by the introduction of **bentonite,** in 1926, as a source of concentrated clay colloids. Even today bentonite remains at the head of the list as a source of desirable drilling-mud colloids.

Continued study has resulted in the trial of many colloids in drilling muds. Of those tried, modified or pregelatinized **starch** and **sodium carboxymethylcellulose** have been accepted and are widely used. These are organic colloids and have some strikingly different properties from the inorganic. They maintain their effectiveness as colloids in the presence of such electrolytes as sodium salts, calcium salts, and magnesium salts. Most of the inorganic clay colloids, however, become flocculated and lose their effectiveness in the presence of these electrolytes.

Many organic colloids such as starch are subject to degradation (fermentation) by microorganisms unless protected by the presence of saturated salt solutions, high pH, or chemical preservatives. Sodium carboxymethylcellulose is quite resistant to such attacks. The following modern muds have been made possible by the development of these colloids.

1. Low-pH organic colloid preservative muds.
2. High-pH organic colloid muds.
3. Saturated salt organic colloid muds.
4. Salty organic colloid preservative muds.
5. Low-pH organic colloid gypsum preservative muds.

Paralleling the development and treatment of colloids in muds was a growing awareness of other functions and poperties and the necessity for development of reproducible tests for evaluation.

The major properties of drilling muds are discussed in the following paragraphs but do not exactly follow the chronological order of their technological development.

Viscosity and Gel

Viscosity and **gel** are different in character but closely related. Changes in the values of one affect the values of the other. Because of this close relationship they are discussed as one subject. Briefly, viscosity is defined as the internal resistance to flow of a substance; for example, pure water has a low viscosity and honey a high viscosity. Gel is defined as the resistance to shear of a substance and is a measure of plasticity and thixotropy. The gels normally encountered in drilling muds have two important characteristics not exhibited by all gels. These are (1) that they increase as the time of quiescence increases, and (2) that agitation restores the original fluidity of the mud which again gels if allowed to again become quiescent. This last property is known as **thixotropy.**

Early in the development of drilling muds it became readily apparent that as clays were added to the drilling water, the viscosity of the slurry increased. If the viscosity became too great the drilling rate decreased. If the viscosity became too low (due to reduction of colloidal material by water dilution) cuttings settled during suspension of circulation and other hole troubles developed.

Many crude methods of measuring viscosity were used. Throwing rocks in the mud was one of the crudest methods employed. In 1930, H. N.

Marsh developed a simple and rugged instrument known as the **Marsh funnel.** It is used to obtain the measurement of the time of flow of a given volume through an orifice of known diameter. This measurement is commonly taken on all drilling muds and is recorded in A.P.I. Code RP 29. It was early recognized, but the more technical people, that this funnel reading was not that of true viscosity but rather the product of viscosity and gel.

Various instruments for obtaining true viscosity measurements have been used. However, the one most commonly used is the **Stormer viscosimeter** and its modified or improved counterparts which give a viscosity under a particular condition of shear. This type instrument is used in all laboratory measurements, by most service-company and drilling engineers but is not a common piece of rig equipment. The test is approved and the procedure described in A.P.I. Code RP 29.

Concurrently with the development of viscosity measurements were the trials at measuring gels. Due to the characteristic of increasing gel with increasing time it became necessary to obtain a measure of this increase. The concept of measuring the zero time, or initial gel, and the 10-minute gel came into laboratory use in the early 1930's. The three measurements, Stormer viscosity, initial gel, and 10-minute gel are A.P.I. tests. They furnish data which can be used as reference and compared from well to well and field to field. Many attempts have been made to correlate Marsh funnel viscosity and Stormer viscosity. However, the inherent difference in the properties being measured makes such correlation impossible.

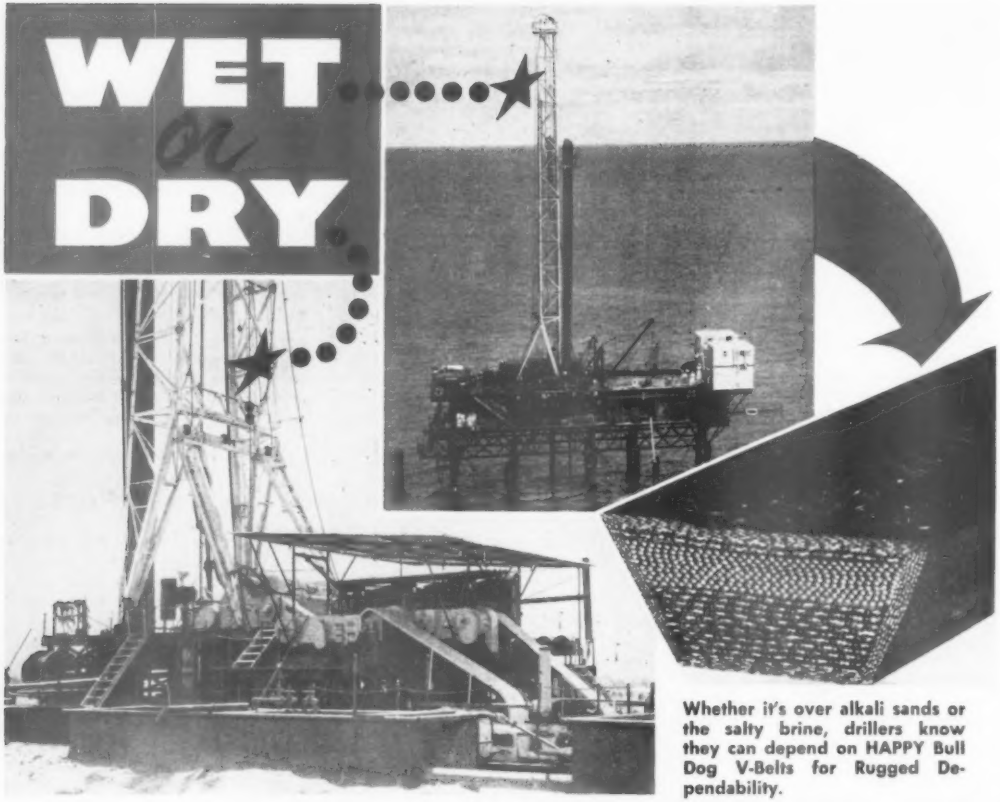
These standardized tests for viscosity and gel have been relied upon in the field and laboratory to evaluate drilling muds and increase their efficiency in the drilling operation. Their early use also showed that drilling mud solids were subject to division into two main groups. These were inert solids which contributed little to viscosity and practically none to gels; and, gel-forming colloids which were responsible for most of the viscosity increase and all of the gel strength present.

The ability to measure these characteristics has been of inestimable value in the later development of chemical treating which allowed the retention of desirable colloid concentration and

DRILLING-MUD CHECK CHART—*General Considerations*

PROBLEMS . . .	CONTROLS . . .
VISCOSITY AND GEL:	
To increase viscosity and gel in fresh water	Add bentonitic colloidal material.
To increase viscosity and gel in salt water	Add salt-resistant clay.
To reduce viscosity and gel when mud has adequate colloidal material	Dilute.
To reduce viscosity and gel when dilution is inadvisable because of inadequate colloidal material, weight reduction	Thin with chemicals.
To reduce viscosity and gel due to high solid content	Add water.
To reduce viscosity and gel (inadvisable to reduce weight)	Add water and weight material.
WEIGHT:	
To increase weight and viscosity	Add solids (weight and bentonitic materials).
To increase weight (with minimum viscosity)	Add high-specific-gravity weight material and chemical thinner.
To decrease weight	Dilute with water, emulsify with oil, or settle out sand and shale particles.
OTHER FACTORS:	
To decrease filter loss and cake thickness (improve filtration characteristics)	Add colloidal material or chemically treat for removal of contaminants and dispersion of colloids.
Mud foaming	Use defoamer. Reduce viscosity and gel if high. Reduce air entrainment by mud cascading through surface system.
Entrained sand, gas, cuttings	Dilute with water or treat with chemical thinners.
Formation pressures:	
Less than normal	Maintain lightweight low-filter loss muds. Use lost-circulation materials.
Normal	Maintain adequate hydrostatic head at all times. Keep hole full of mud.
Greater than normal	Maintain adequate hydrostatic head, with low viscosity and gels. Keep hole full of mud at all times.
Cement contamination	Chemical treatment to counteract calcium ion. Employ mud tolerant to cement.
Lost circulation	Add colloidal material. Maintain minimum safe mud weight. Use lost-circulation materials. Maintain low pump pressures. Use care in pulling or spudding drill pipe and in starting pumps.
Anhydrite and gypsum contamination	Chemical treatment to counteract calcium ion. Employ mud tolerant to anhydrite or gypsum contamination.

WET or DRY



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the control of viscosity and gel strength in the variable ranges demanded by the drilling operation. This ability to measure coupled with the control afforded by chemical treatment was necessary for the still later development of filtration control. This will be discussed at more length later.

The known functions of transporting cuttings and cooling the bit were expanded as the concept of viscosity and gel strength developed. The greater viscosity of mud over water gave the mud more efficiency in cutting and caving transportation. The thixotropic character of the gel strength performed the function of suspension of cuttings in the hole during periods of circulation shutdown. It also allowed the cuttings and sand to settle out of the mud in the ditches and pits. These seemingly opposite requirements are performed because the mud, upon cessation of circulation, develops a definite gel which supports entrained particles up to rather large sizes. On the other hand these particles are free to settle in the ditches and pits because the movement of the mud in its passage through the surface system prevents the gel from forming and the mud approaches the character of a nongelling fluid.

Weight

"Mud weight" is an industry-wide colloquialism for density. It is normally expressed as the weight of the mud in pounds per gallon or pounds per cubic foot. The expression is intimately associated in the minds of the users with the prevention or overcoming of blowouts.

"Blowout" is another colloquialism covering the violent uncontrolled escape of gas, oil, and water from the well. The mechanism by which weighted muds control blowouts, through exertion of adequate hydrostatic head upon the formations and their contents, is common knowledge.

The primary function of weighted muds is, therefore, to control gas, oil, and water pressures in the formations penetrated. This is accomplished by having a mud heavy enough to furnish a positive hydrostatic pressure differential against the contents of the formations.

A minor function is prevention of caving and is accomplished through three effects of heavy muds. First, a positive differential pressure applied against the formations tends to hold them in place mechanically. Second, preventing sloughing caused by the migration of formation fluids into the bore hole. Third, the buoyant effect of heavy mud lessens the tendency of unconsolidated or fractured formations to gravitate into the hole.

Formation solids and surface clays were the first materials which added weight to drilling muds. The higher the percentage of inert solids (nongel-forming colloids), the higher the weight of the mud. These solids have a **specific gravity** of about 2.5. They are capable of making muds weighing between 11 and 12 lb. per gallon at which point the muds become too plastic to use. Such muds are low in colloids and have undesirably high filter losses and thick cakes. Many of the early blowouts were caused by a combination of light weight, high viscosity and gels (chemical thinners were unknown until 1930), the recycling of gas, and swabbing of the hole.

In order to make a heavy mud it became necessary to use materials having higher specific gravities than clays,

MUD CHECK CHART—*Surface Drilling*

PROBLEMS . . .	CONTROLS . . .
UNCONSOLIDATED SANDS AND GRAVELS:	
Caving	Adequate gel strength to consolidate loose sand. Maintain filtration properties below 15-cc. filter loss to prevent hydrous disintegration of shales. Prevent erosion by adequate viscosity and gel strength. Maintain sufficient viscosity for lifting cuttings and cavings.
Lost circulation	Maintain colloidal content to provide good filtration properties, low density, and thick mud. Viscosity pill and lost-circulation materials. Care in use of mechanical equipment.
Retention of sand in mud. (Weight buildup. Sand retained in mud will increase density, which may aggravate tendency towards lost circulation.)	Low enough viscosity and gels to allow sand to drop out in ditch and pits by reducing viscosity and gels with water dilution and chemical treatment. Ditch and pit arrangement may be improved to promote sand settling.
CLAYS AND SHALES:	
Excessive viscosity and gels, tight hole, sloughing, hydrous disintegration	Reduce viscosity and gels; reduce filter loss to prevent hydrous disintegration or sloughing.
HARD ROCK:	
Removal of cuttings from hole	Maintain colloidal content high enough to provide gels and viscosities adequate to remove cuttings or prevent settling. Also, sufficient annular velocity will facilitate removal.
CHARGED SAND:	
Pressure control	Weighted mud above formation pressure. Maintain low viscosity and gels for gas removal. Keep hole full at all times.
Cement contamination	If saving mud, thin with water and chemicals. If not saving mud, discard contaminated mud and mix fresh mud.

sands, and limestones. First recorded purposeful use of such a material occurred in Morehouse Parish, northern Louisiana, in 1925. **Iron oxide,** specific gravity about 4.4, as used in making paints was used to make a heavy mud for killing a blowout. **Barium sulfate,** specific gravity 4.2 to 4.4, was introduced as a weighting material in 1925. Other heavy minerals have been tried or considered. Today ground barium sulfate is almost the only heavy mineral used to weight up drilling muds. It is inert, readily available in quantity, and cheap. Satisfactory muds are made which weigh in excess of 20 lb. per gallon (150 lb. per cubic foot).

Mud Weight Testing

In the early days of rotary drilling mud weight and high viscosity were frequently confused. A drilling-crew member would look at the thick viscous mud flowing through the pits and say the mud was " plenty heavy."

A gallon bucket poured full of mud and weighed on ordinary beam or spring scales was one of the first weight tests used. This test gave an approximation of mud weight. Even though crude, this test created an awareness of the variations in weight which could not be judged by visual inspection.

The first standard instrument for obtaining mud weight was introduced about 1929 and was known as the **Braun Mudwate hydrometer.** It was a simple instrument that for good results, required that the water in the hydrometer case be kept clean and not allowed to fluctuate over wide ranges in temperature.

The **mud balance** followed the Mudwate hydrometer and it was developed by P. H. Jones and first used in 1936. Both of these instruments are approved and described and the testing procedure set forth in A.P.I. Code RP 29.

The art of chemical treatment has contributed more to drilling success than any other phase of the handling and use of drilling mud. Chemical treatment is designed to control the behavior of clay suspensions and the basis of this control is contained in the principles of colloidal chemistry.

The chemical treatment used for control of the behavior of the clay in the suspension depends upon the total percentage of dispersed and potentially dispersible clay, the shape of the clay particles, their particle-size distribution, the electrical charge upon the particles, their hydration characteristics, their base exchange capacity, and the amount and nature of the other solids suspended or dissolved in the mud. Since the properties and concentrations of clays and other solids in the mud continually vary it is not surprising that different kinds and quantities of chemicals are required for successful treatment. Indeed it is surprising that the list of chemicals which have survived testing and remain in common use is so small.

DRILLING-MUD CHECK CHART—

PROBLEMS . . .	CONTROLS . . .
SHALES:	
Sloughing, caving, heaving	Employ mud with low filter loss, low viscosity and gels. Utilize high concentration of colloidal material and thin with chemicals.
Hydration, swelling, and dispersion in presence of conventional filtrates	Maintain minimum filter loss. If possible use chemicals instead of water to thin mud. Repress hydration by presence of calcium ion.
Internal high pressure	Maintain adequate mud density.
Swabbing action of bit withdrawal	Maintain thin filter cake, low gels. Withdraw bit slowly. Check to see that hole is taking mud through the annulus.
Lubricating effect of filtrate or mud on shale plane	Maintain minimum filter loss. Utilize lost circulation materials to keep mud in hole.
Slow digging balls up bit	Employ chemical thinners and water dilution if clay solids are high.
Overtreatment with chemical thinners. Mud does not respond.	Change type of chemical thinners. Add water. Add new mud.
Weight buildup with formation solids	Dilute with water.
Chemical reactive shales which render use of high pH muds difficult	Employ low or medium pH muds.
Increase in filter loss	Add colloidal material. Check for contaminants and if present chemically treat.
Mud making, viscosity and gel buildup	Dilute with water. Use chemical thinners.
SALT OR SALT WATER BEARING FORMATIONS:	
Flocculation of drilling mud. Corrosion of drill pipe. Pressure from salt-water intrusion	Prevent or overcome flocculation by use of salt-resistant materials and chemical treatments resulting in salt tolerant muds. Add corrosion inhibitor. Maintain adequate mud density. Employ salt-resistant muds.
SAND:	
Low-pressure circulation losses	Employ as light a mud as consistent with safety. Use lost-circulation materials if necessary. Spot-treat with lost-circulation materials. Check operation of mechanical equipment.
Cake buildup-tight hole	Add colloidal material to reduce cake thickness.
High filter loss	Add colloidal material to reduce filter loss.

Chemicals first were added to thicken mud. Very shortly, however, the error of this thinking was discovered and except for unusual cases chemical treatment has since been concerned with reduction of viscosity and gel and control of filtration. **Silicate of soda** was probably the first **thinner** added to drilling mud. This treatment was old in the ceramic field and moderately successful in clay suspensions containing low percentages of colloids.

About 1930 solutions of **caustic soda** and **quebracho** were introduced as thinners. Such solutions have proved to have a wide range of usefulness and have remained popular. The first additions were in comparatively small amounts and would today be considered very light treatments. Modern **"red muds"** contain heavy concentrations of caustic soda and quebracho (2 to 6 lb. of each per barrel of mud.) Use varies through the entire range of light to heavy additions and these treatments are profusely discussed in drilling-mud literature. Many **tannins** and some **lignins** and lignite derivatives have been similarly used. Price, availability, and effectiveness as thinners have eliminated all but a few of these substances.

Shortly after the introduction of alkaline-tannate mixtures the **orthophosphates** were tried. These have very limited usefulness as thinners in modern treatments. Then came the **glassy** and **crystalline polyphosphates.** These are a very effective group of thinners and are widely used. However, their efficiency rapidly decreases as temperatures rise in deep drilling. Many attempts have been made to modify these polyphosphates in a manner which would increase their resistance to high-temperature decomposition. Thus far no satisfactory modification has proved successful enough for use in the field.

Chemical decomposition is not peculiar to the polyphosphates but exists to some extent with all chemicals. For instance, sodium hydroxide plus carbon dioxide, or calcium bicarbonate, magnesium carbonate or bicarbonate results in sodium carbonate being formed. Too much sodium carbonate will thicken drilling muds. This reaction and some others are reversible. For instance, sodium carbonte plus calcium hydroxide (hydrated lime) results in the formation of calcium carbonate and sodium hydroxide. In this case the sodium carbonate may be a contaminant which by chemical reaction may be regenerated to the desirable sodium hydroxide.

For many years hydrated lime was used to thicken muds. It was present in most muds when they became contaminated with cement and had been used to maintain a high pH for preservation of organic colloids. Its first purposeful use for controlling viscosity and gel was in the 1940's. The reaction of hydrated lime on the colloidal clay in the mud went beyond

Intermediate and Deep Drilling

PROBLEMS . . .	CONTROLS . . .
SILTSTONE:	
Weight buildup	Thin with water or chemicals to release sand by reduction in viscosity. Maintain adequate colloids.
ANHYDRITE AND GYPSUM:	
Flocculation of drilling mud: High flat gels. High filter loss. High viscosity	Chemically treat to counteract gyp and anhydrite flocculation. Employ drilling-mud tolerant to gyp and anhydrite contamination.
LIMESTONE:	
Lost circulation	Add colloidal material. Employ lost-circulation materials. Drilling with air or gas may be feasible. Check operation of mechanical equipment.
HARD ROCK (SCHIST, IGNEOUS, ETC.):	
Transportation of cuttings	Increase viscosity and gels by addition of colloidal material.
FRACTURED FORMATIONS AND CONGLOMERATES:	
Lost circulation	Increase viscosity and gels. Employ lost-circulation material. Use lowest density mud possible. Drilling with air or gas may be feasible. Check operation of mechanical equipment.
MISCELLANEOUS SALT-BEARING FORMATIONS (Magnesium and calcium chloride; magnesium and calcium sulfate and oil):	
Flocculation of drilling mud. Corrosion of drill pipe	Employ drilling mud not susceptible to flocculation. Chemical treatments resulting in salt tolerant muds. Add corrosion inhibitor.
GAS AND OIL BEARING FORMATIONS:	
Blowouts. Gas-cut mud	Add weight materials to raise density of drilling mud. Thin mud with water and chemicals to permit release of entrained gas. Increase gas removal efficiency in ditches and pits.
Protection of formations	Lower filter loss and cake thickness.

the dispersing effect of the polyphosphates in that it reduced the effective size of the clay colloid by dehydration or reduction of the amount of water absorbed on each clay particle. This reaction reduces viscosity by making more room in the mud for solids. The clays become, at least in part, calcium clays instead of sodium clays. They have less gelling properties and are more stable in the presence of such contaminants as sodium chloride and calcium sulfate.

A currently used variant in mud treatment consists of keeping clay colloid concentration to a minimum, using relatively light caustic-quebracho additions and maintaining suspending and filtration properties of the mud with an organic colloid.

Before chemical treatment, water addition (dilution) was the only means of reducing viscosity and gel. Such dilutions, of course, reduced the concentrations of all solids, colloidal clays, inert low specific solids and inert high density weight materials. This reduced the weight of the mud causing many blowouts. Where weighting materials were used large additions of the materials were required to overcome the weight reduction occasioned by the water. If the diluting water contained contaminating salts it increased the viscosity and gels. An even more serious result, although the early drillers were not cognizant of it, was the increase in filter loss and cake thickness which caused much tight hole, stuck drill pipe, and damage to productive sands.

Where neither weight nor filter loss is critical, water is an excellent control agent. It is not meant to imply that chemicals eliminate the necessity of water addition. Water will always be needed to supply the optimum liquid phase required in a given drilling mud.

Chemical Treatment Allows:

1. Reduction of gels so that sand and shale particles may be efficiently settled out of the mud into the ditches and pits.
2. Reduction of viscosity and gels without reducing colloidal concentration.
3. Maintenance of same viscosity and gels and increase in colloidal concentration.
4. Increase in viscosity with very low gels and greatly increased colloidal concentration.
5. Reduction of gels to reduce swabbing tendency when pulling drill string.
6. Reduction of viscosity and gels to allow efficient degassing of mud in the surface mud system.
7. Reduction of viscosity and gels to increase mud pump efficiency.
8. Reduction of viscosity and gels to reduce the flow friction in the hole thereby reducing back pressure on the formation and minimizing loss of circulation.
9. Viscosity and gel control to give good fluid flow characteristics which keep enlarged sections of the hole from loading up with gelled mud and cuttings.
10. Maintenance of desirable viscosity and gels while increasing mud weight with weighting materials and minimum use of water.
11. Maintenance of desirable viscosity and gels while reducing filtrate volume and filter cake thickness with colloids.
12. Removal of contaminants which have a deleterious effect upon viscosity and gels.
13. Design of a drilling mud which is tolerant of contaminants.
14. Design of a drilling mud which has minimum hydrating effect upon formation shales and clays.
15. Adjustment of pH of the drilling mud to optimum value.
16. Design of a drilling mud having minimum corrosive tendencies.
17. Design of a drilling mud which will preserve organic colloids.
18. Design of emulsion muds.
19. Correction of the tendency of certain muds to form a stable foam.

Filtration

The development of the concept of filtration and the methods of controlling and modifying its effect upon drilling and subsequent production have been equally as important as the control of any other single mud characteristic.

Measurement of the filtration properties of drilling mud furnishes an index of the ability of the mud to form low-permeability filter cakes on the walls of the bore hole and minimum filter loss invasion of the drilled formations. The lower the permeability the thinner the cake and the lower the volume of filtrate from muds of comparable solids content. Low permeability filter cakes are directly dependent upon the amount and physical condition of the colloids in the mud.

Thin filter cakes cause a minimum of interference to the passage of tools in the hole.

Thin filter cakes minimize swabbing tendencies when pulling the drill string from the hole.

Thin filter cakes result in better casing cement jobs.

Minimum filter loss minimizes hy-

DRILLING-MUD CHECK CHART—*Completions*

PROBLEMS . . .	CONTROLS . . .
SANDS:	
Low-pressure: Water or mud blocking. Screen plugging	Minimum-filter-loss muds. Minimum-weight muds. Thin, friable filter cakes.
Normal-pressure: Water or mud blocking. Cleaning up	Minimum-filter-loss muds. Thin, friable filter cakes.
High-pressure: Blowout prevention	Maintain adequate mud density. Maintain full hole. Withdraw tools slowly. Maintain low gels and thin filter cakes.
LIMESTONES, CORAL REEF, DOLOMITE, FRACTURED SHALES, CONGLOMERATES AND SCHISTS:	
Lost circulation	Maintain minimum safe mud density.
Formation protection	Minimum filter loss. Employ lost-circulation materials. Check operational methods of handling drill string and pumps.

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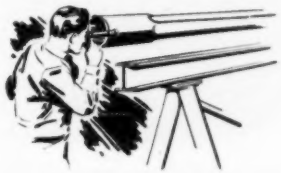

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dration of shales with associated caving.

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Probably the least understood of all the early field treatments of drilling mud was the addition of bentonite. Field users said that mud containing bentonite was slippery and slicked up the hole resulting in less trouble with tight places. Actually they were increasing the concentration of colloids which in turn reduced the cake thickness, especially on very permeable formations.

One of the early tests for judging the body of the mud consisted of dipping a finger in the mud, rubbing the mud between finger and thumb—then going through a slinging motion to see how well the film of mud would cling to the finger.

The control of filtration owes much of its development to the technical people.

The first work on filtration of drilling muds was done in the middle twenties. Only the filter cake thickness was measured. No importance was placed on the volume of filtrate which if measured was not recorded.

The study of filtration received only cursory attention until the early 1930's. When consideration of the effects of filtrate volume were included in the thinking great emphasis was placed on filtration characteristics. The forerunner of the present portable filter press was introduced to the field in 1936. This instrument has become a standard piece of equipment on many rigs, with all mud engineers and all laboratories engaged in the study of drilling mud. Testing is standardized and described in A.P.I. Code RP 29.

The function of drilling fluids having proper filtration characteristics is to seal the face of the formation exposed in the bore hole with a thin, low-permeability filter cake which prevents excessive loss of filtrate to formations.

Use of inorganic colloids, organic colloids, and chemical treatment for control of their physical state in the fluid are the means used to control the filtration properties of muds.

With the advent of deep drilling which encounters high earth temperature (300° to 400° F.) it was found that colloids behaved differently from the way they did at lower temperatures. This behavior is largely due to changes in chemical equilibria and the acceleration of various chemical reactions at these higher temperatures.

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Equipment for duplicating these conditions must obviously be of special design. Most of the testing and developing of muds having suitable high-temperature characteristics must therefore depend upon detailed laboratory research correlated with field usage of recommended materials and practices. Such methods will continue to meet drilling-mud problems as they arise.

Miscellany

Various other tests for determinafion of mud properties and constituents are made. Tests for alkalinity, acidity, concentration of various salts, and added chemicals are standardized. These tests properly belong with the chemical-treating phase of mud.

Sand content is a conventional test. Minimum sand content gives muds of minimum abrasion characteristics. Abrasive erosion of pipe and pumps has cost the drilling industry tremendous amounts of time and money. Control is by mechanical separation or settling through proper gel strengths and ditch and pit design.

Glossary—Baroid Products and Services

Anhydrox (barium carbonate)... For treating anhydrite or gypsum contamination in drilling fluid.

Aquagel... A gel-forming Wyoming bentonite.

Barafos (sodium tetraphosphate)... A polyphosphate drilling fluid thinner.

Baroco... A salt-water-resistant clay.

Baroid (barite)... Drilling-fluid weighting material.

Carbonox... An organic thinner and emulsifier.

Driscose (sodium carboxymethyl cellulose)... An organic chemical for providing low-filter-loss drilling fluids.

Fibertex (ground sugar-cane fiber)... A fibrous material for preventing or overcoming los circulation.

Hydrotan... A water-soluble alkaline-tannate for thinning drilling fluid.

Hydrocarb... A water-soluble alkaline carbonox for thinning or emulsifying drilling fluids.

Impermex (pregelatinized starch)... An organic colloid for extremely low-filter-loss drilling fluids.

Impermex Preservative No. 5 (antifermentative agent)... For preservation of organic colloids such as Impermex.

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New Developments in Oil-Base Drilling Fluids

In the short span of a decade and a half, oil-base mud has won widespread acceptance and popularity

by Thad Randolph*

ALTHOUGH oil-base drilling fluids were originally conceived and first used in the field in the middle thirties it has only been in recent years that they have received widespread acceptance in the industry. A principal reason for the acceptance has been the better well performance secured from use of these muds, and the better well completions obtained higher productivity indexes as to oil permeability.

It has been known for many years that water has a very damaging effect on the productivity of many producing zones. Since all water-base and emulsion-type drilling fluids have a water loss under down-hole conditions and are continually losing water to the pay zone during the drilling operation, it naturally follows that a water-free drilling fluid should give much better results when used for drilling a pay zone. The literature is replete with both laboratory experiments and actual field results with oil-base drilling fluids that show the logic and truth of the above statement.

It has been shown in the laboratory that many sands when exposed to fresh water show a permeability reduction from a small percentage up to 100 per cent. There are several actual field examples wherein a pay zone was originally drilled with a water-base mud and failed to produce, but when the well was sidetracked and the sand redrilled with an oil-base drilling fluid the well made an excellent producer. These examples are of course unusual, but there are many data to substantiate the idea that practically all pay zones are damaged to some extent by the introduction of fresh water.

Example . . . One of the most recent examples is detailed in Table 1. In this case two offsets only 300 ft. apart were spudded in, drilled, and completed within a few days of each other. The only difference in their drilling procedure was that one was drilled in with a "low-water-loss" clay-water mud while the other was drilled in with oil-base drilling fluid. The producing sand in both wells had similar characteristics and the productive interval was almost identical.

It will be noted that the oil-base completion came in for 206 bbl. per day flowing, while the water-base well only made 120 bbl. per day flowing by heads. It should be noted that the water-base well has larger pipe and larger liner which should have been a decided advantage for greater initial production figures. It was found that the water-base well could only be produced successfully by pumping. During the first 87 days of production the oil-base well actually produced 2,281 bbl. more oil than the water-base well and was still flowing at a rate of 42 bbl. per day greater than the pumping rate of the water-base completion.

It might also be mentioned that only 30 bbl. of oil-base drilling fluid was lost during the drilling and completion of this well. The remaining mud was saved to be used on the next well.

*Oil Base, Inc.

THE AUTHOR

Thad Randolph is vice president and sales manager of Oil Base, Inc., Compton, Calif. He joined Oil Base in 1945 following Naval service. He is a graduate of Oklahoma A. & M. with a degree of bachelor of science in chemical engineering. His oilfield experience includes a stint with Stanolind Oil & Gas Co. as roustabout, switcher, roughneck, and mud engineer.

whereas the 350 bbl. of water-base mud was discarded upon completion. The cost of the water-base mud far exceeded the cost of the expended 30 bbl. of oil-base mud.

Factors in Ultimate Production

At the present time most operators will agree that higher initial productivities can be expected from wells completed with oil-base drilling fluid. In many cases, however, especially in those states with strict proration laws, the operator is not particularly interested in high initial rates of production so long as the well will make its allowable. All operators are, of course, primarily interested in ultimate recovery from the reservoir. Theoretically at least some of the damage done by the introduction of water to pay zone should be permanent, and thus affect the ultimate recovery from that zone. In recent years several studies have been made in various fields attempting to substantiate this theory.

Probably the outstanding example of these recovery studies is in a San Joaquin Valley field which was drilled in the late thirties. In this field there are four wells drilled in with oil-base drilling fluid offsetting four wells drilled in with water-base. A comparison of these eight wells is shown in Table 2. It will be seen that, although the four water-base wells had an average of more millidarcy-feet of sand and had produced an average of 1 month longer than the oil-base wells, that actually the oil-base wells outproduced the water-base wells by almost 40 per cent on the average. Furthermore, at the end of 6½ years of production the average specific productivity index of the oil base wells was over 50 per cent higher than the average for the water-base wells, wells, which would indicate that the oil-base wells should continue to outproduce the water-base wells in the future.

Deep Drilling

A good oil-base drilling fluid contains no water originally and is so designed that reasonable amounts of water contamination picked up during the drilling operation are so tightly emulsified that it can not be filtered out. Due to their composition, oil-base drilling fluids generally have a higher initial cost than water-base mud; however, the actual cost for using oil-base fluids in many cases is considerably less than that for water-base-type mud, due to low maintenance cost, plus the fact that good oil-base muds can be used over and over again. Due to their stability under extreme high-temperature and high-pressure conditions, plus the fact that they are very easily and cheaply maintained, oil-base drilling fluids in recent years have found more and more use as actual drilling muds, particularly in deep, high-temperature wells. The following four examples will serve to illustrate this new application.

Example No. 1 . . . A deep wildcat in the Gulf Coast area was diamond coring using a very low-water-loss starch mud and was requiring from 12 to 16 hours per core to condition mud, plus as expenditure of approximately $600 for mud materials per core. The bottom-hole temperature at this time was approximately 320° F. At a total depth of 14,670 ft. the water-base mud was displaced with Black Magic premixed mud. After the introduction of the Black Magic there was no rig time chargeable to the drilling fluid and no mud materials added to the circulating system for the next 6 weeks, during which time continuous diamond coring was done.

This well was diamond cored to a total depth of 20,450 ft. with almost 100 per cent core recovery and the average daily maintenance cost for the Black Magic drilling fluid was less than $50 per day. It is interesting to note that at one stage of this operation the hole stood full of mud without circulating for a period of almost 6 months, with about 6,000 ft. of open hole exposed. On going back into the hole at the end of this time, circulation was broken at approximately 15,000 ft., with only 600 psi. pump pressure and the mud properties were practically identical to those at the time of shutting down 6 months previously. This well has a recorded bottom-hole temperature of 389° F.

TABLE 1—TWO OFFSET PRODUCERS, 300 FT. APART

Completion data—	Water-base well*	Black-Magic well
Completed	12-22-51	12-30-51
Total depth, ft.	2,936	2,967
Casing size, in.	8⅝	7
Casing, ft.	2,801	2,835
Liner size, in.	6⅝	5
Liner (slots)	0.100	0.080
Liner depth, ft.	2,782-2,936	2,813-2,967
Liner, ft.	154	154
Oil sand, ft.	80	90
Production data—		
Initial prod., bbl. per day	†120	†206
Choke, in.	16/64	20/64
Tubing, psi.	80	90
Casing, psi.	0	10
Production (1-7-52), bbl. per day	75	128
Choke, in.	20/64	20/64
Tubing, psi.	35	90
Casing, psi.	0	160
Production (3-23-52), bbl. per day	99	141
Choke, in.	(pumping)	20/64
Tubing, psi.	20	75
Casing, psi.	600	900
Total production (3-23-52), bbl.	7,563	9,844
Average bbl. daily (from start)	80	113

*The water-base well is 30 ft. higher structurally.

†Both wells came in flowing but production and pressure of the water-base well diminished despite several attempts to bring it back. Oil was circulated, the liner slots were washed, it was put on the gas lift, and finally on February 8, it was put on the pump which brought up the daily average. The Black-Magic well is still flowing.

TABLE 2—TOTAL AVERAGE COMPARISON, SAN JOAQUIN VALLEY FIELD

	Well	Months	Oil prod.	Md.-ft. sand	S.P.I. (last one)	Static pressure
Water base	A	87	490,800	25,300	.00531	3,145
	B	78	256,200	20,700	.00132	3,135
	C	84	260,200	21,000	.00129	3,165
	D	67	123,800	7,650	.00034	2,995
Total		316	1,131,000	74,650	.00826	12,440
Average		79	282,750	18,662	.00206	3,110
Oil base	E	94	603,400	24,000	.00284	3,170
	F	83	487,500	19,950	.00294	3,100
	G	52	205,200	17,820	.00345	2,835
	H	82	273,200	9,360	.00357	3,125
Total		311	1,569,300	71,130	.01280	12,230
Average		78	392,325	17,782	.00320	3,058

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Example No. 2 . . . A deep test in the Gulf Coast area had 7-in. casing set at 10,327 ft. At this point the mud system was converted to a very low-water loss starch emulsion and the hole was drilled to a depth of 13,285 ft. with mud weight averaging 16 lb. per gal. Most of this hole was in very treacherous, heaving shale and there was considerable tendency for the bit to ball up and quite a bit of tight hole.

At this depth a salt-water flow was encountered and in attempting to combat it, circulation was lost and the hole below the casing was lost completely. After several squeeze jobs at the base of the casing in attempting to regain circulation, it was finally decided to convert to Black Magic oil-base drilling fluid. The Black Magic was weighted to 15.8 lb. per gal. and the water-base mud was displaced at the base of the casing.

Drilling was commenced and within 12 hours some 500 ft. of hole had been made and the hole was clean. The hole was then drilled to a total depth of 12,006 ft. with the oil-base mud with no further trouble and at very high drilling rates. Surveys of the original hole against the new hole showed that the oil-base hole sidetracked at approximately 500 ft. below the casing point and from there on to 12,006 ft. it was new hole. The drilling rate in the new hole averaged over 15 ft. per hour, while this same section drilled in the old hole with emulsion mud drilled at an average rate of 7 ft. per hour.

It should be pointed out that although this is recognized as one of the worst heaving shales in the Gulf Coast, at no time was there any hole trouble, tight hole, or tendency for the bit to ball up while the oil-base mud was in the hole. It might also be mentioned that during the 2-week period the oil-base mud was in use there was no maintenance expense, even though it was a 16-lb. per gal. mud.

Example No. 3 . . . A deep test in the San Joaquin Valley area set 9⅝-in. casing at approximately 11,000 ft. At this point the water-base mud was displaced with Black Magic weighted to 11.3 lb. per gal. (85 lb. per cu. ft.) and diamond coring and diamond drilling commenced. Most of the hole has been drilled with diamond drilling bits which have been kept in the hole for periods as long as 8 days. Only one diamond core head has been used, and it has already cut 700 ft. and is still in very good condition.

This job has now been in progress for approximately 6 months and is now coring at approximately 15,000 ft. with a mud weight of 15.4 lb. per gal. (115 lb. per cu. ft.). The mud maintenance cost is averaging about $45 per day

which is quite remarkable, particularly considering the fact that the flow-line temperature is 170° F. At approximately 13,800 ft. a high-pressure salt-water flow was encountered and it was necessary to increase the mud weight to 16.7 lb. per gal. (125 lb. per cu. ft.) in order to kill it.

Example No. 4 . . . A semiwildcat in the Seal Beach area set 7-in. casing at 8,065 ft. and converted to Black Magic drilling mud due to hole trouble on previous well in same area using low-water-loss emulsion mud. This hole was drilled and cored to a total depth of 10,110 ft. in 79 days with no hole trouble whatever and no rig time chargeable to mud conditioning. Drilling mud maintenance cost averaged $51 per day.

High-Weight Fluid for Use Above Packers

One of the greatest problems facing the industry today, particularly in the Gulf Coast area, is to find a fluid that can be weighted to extremely high weights and will remain stable under high temperature and pressure conditions, for placement in the annulus above production packers on high-pressure wells. Laboratory tests on Black Magic weighted with barite to as high as 21 lb. per gal. (157.5 lb. per cu. ft.) have been run for periods of 2 weeks under pressure and at temperatures up to 400° F.

These tests have shown that this fluid remains stable under these conditions, and shows no settling of weight material that could not be pumped out. There is no tendency for this fluid to disintegrate or solidify under these conditions. It is felt that this fluid could be placed in the annulus above a production packer and at any later date the packer could be pulled and the fluid circulated out of the hole.

Corrosion

Another serious problem, which can probably be solved by the use of oil-base drilling fluids, is that of exterior corrosion of casing. This problem is very prevalent in Kansas and West Texas due to the presence of highly corrosive waters or salt sections behind the casing.

Due to the exceptional stability and plastering properties of a good oil-base mud, this fluid could be placed behind the casing at the time the casing is set, either by running it ahead of the cement, or by use of a port collar. The fluid should remain in place indefinitely and could be weighted high enough to hold back any formation waters. Several jobs of this type are now in process and many other operators are seriously considering this application of oil-base drilling fluids. A new product

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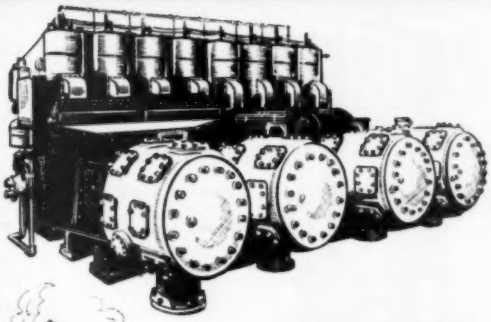

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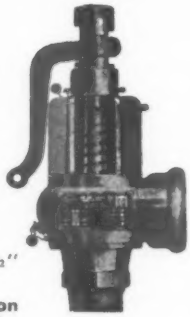

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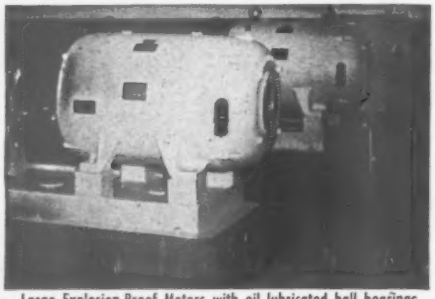

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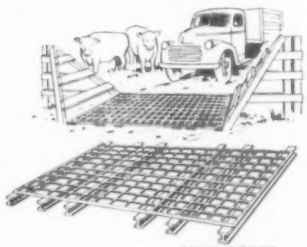

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under the trade name "Pepto Magic," is ideally suited to this application. Pepto Magic is a dry powdered material which is easily mixed at the rig with either an asphaltic-type crude oil or fuel oil to form an excellent oil-base drilling fluid, which may be weighted to any desired weight. This material is particularly adaptable to placement behind casing since the weight material will stay in suspension indefinitely through peptization.

Jet Perforating

Some of the major oil companies have recently conducted tests, both in the laboratory and in actual wells, which definitely indicate that oil, or oil-base drilling mud, is much superior to any type of water-base drilling fluid for jet perforating. In some of the tests conducted under actual well conditions it was found that the holes shot in clay-water muds and emulsion muds were actually filled with dehydrated clay solids. This was not the case in holes shot in oil, and the holes shot in weighted oil-base muds were found to contain only a soft mush which could be easily removed. Since in most cases of jet perforating it is necessary to have a weighted mud in the hole, it is impractical to attempt to spot straight crude oil or diesel oil opposite the zone to be perforated, as the oil would undoubtedly rise and mix with the water-base mud during the round trip prior to actual perforating. Oil Base, Inc., has made available to the industry Black Magic Premix in 53-gal. drums for easy transportation and handling at the rig for this application. This premixed oil-base mud can be weighted to any desired weight at the rig site and spotted in the hole opposite the zone to be jet perforated. Quite a number of these jobs have already been performed with excellent results and several operators have standardized on this procedure for all wells where jet perforating is utilized.

Freeing Stuck Drill Pipe

Another unusual use of oil-base drilling fluids is in freeing pipe that has been stuck while drilling with water-base mud. In this application the entire system of water-base mud is displaced with oil-base mud of the same weight and the oil-base mud is then circulated in order to remove the thick water-base filter cake and lubricate the hole. To date there are 12 case histories of wells where this has been done and in 10 of these cases it has been successful in freeing the stuck pipe.

Logging

One of the primary objections in the past to the use of oil-base drilling fluids has been the difficulty in obtaining an adequate electric log. This situation has improved greatly in the past year or two and is continuing to improve with the development and refinement of the induction log. The induction log, as presently used in oil-base drilling fluids, gives excellent resistivity curves and is thought by many operators to actually be more accurate than a normal electric log. The only shortcoming of the present induction logging system is the lack of an S.P. curve or permeability indication. It is understood that one of the major logging companies is now developing a new tool which should be on the market in the near future that will give an excellent permeability log in oil-base mud. This development should overcome all objections from the logging standpoint, since all other logs such as gamma ray, neutron, caliper, etc., can be run in oil-base mud with as good results as are obtained in water-base mud at the present time.

Lost Circulation

The problem of lost circulation is one that may be always present to some degree and is particularly serious when it occurs in a pay zone. Most operators are hesitant to use any of the normal lost-circulation preventives in a pay zone for fear of doing some permanent plugging. A new lost-circulation addi-

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Since Formaseal is slowly, but completely, soluble in live crude oil, it has found ready acceptance in areas where circulation is lost in the pay zone, particularly where the zone is being drilled with crude oil or oil-base drilling fluid. There are many cases where the pay zone is drilled with crude oil and several hundred barrels per day of oil are lost during the drilling operation. By the use of relatively small amounts of Formaseal this loss has been cut down to practically zero, thus saving the operator not only the cost of transporting the oil to the rig, but also the cost of reproducing the oil and possibly a double royalty cost. Formaseal has also been successfully used in stopping lost circulation in water-base and emulsion muds.

Oil-Base Advantages

As oil-base drilling fluids continue to improve progressive operators will undoubtedly find more and more new applications for them. They have many inherent advantages over any type of water-base fluid. They can be operated successfully at weights as low as 7.8 lb. per gal. or as high as 21 lb. per gal. They are not subject to contamination from salt, cement, gypsum, or any other calcium or magnesium ion. There are many cases on record of long sections of salt, cement, and anhydrite having been drilled with Black Magic without any mud treatment. Good oil-base drilling fluids remain stable under extremely high temperature and pressure conditions. Mud-making clays and shales can be drilled with no treatment necessary since oil-base muds make no mud while drilling; everything penetrated is removed from the hole as solid cuttings.

Glossary—Oil Base, Inc., Products

"Light" Black Magic . . . A dry powder, containing blown asphalt, and so formulated that when one sack is mixed with the proper kind and amount of oil, one barrel of 8.02 lb. per gal. (60 lb. per cu. ft.) oil-base drilling fluid results.

"Regular" Black Magic . . . A dry powder, containing blown asphalt, and so formulated that when two sacks are mixed with the proper kind and amount of oil, one barrel of 9.63 lb. per gal. (72 lb. per cu. ft.) oil-base drilling fluid results.

"Heavy" Black Magic . . . A dry powder containing blown asphalt, and so formulated that when 2.4 sacks are mixed with the proper kind and amount of oil, one barrel of 10.7 lb. per gal. (80 lb. per cu. ft.) oil-base drilling fluid results.

Black Magic Premix . . . A ready-to-use, lightweight oil-base drilling fluid (7.8 lb. per gal., or 58 lb. per cu. ft.) containing no weight material, consisting of Black Magic completely mixed with oil. It can be weighted to any desired weight.

OB Gel . . . A dry powder, containing

blown asphalt, which increases the viscosity and plastering properties of Black Magic when added to the mud stream at the rig.

OB Gen . . . A dry powder which regenerates water-contaminated oil-base drilling fluids quickly and economically for reuse.

OB Wate . . . Weight material for oil-base drilling fluids or low-weight White Magic emulsion mud.

OB Hevywate . . . Weight material of high specific gravity for "Heavy" Black Magic or White Magic emulsion mud.

OB MixFlx . . . A high-boiling liquid which reduces aniline point and corrects a faulty mixing oil used for Black Magic drilling fluids.

OB Zero . . . A liquid polymer which increases the viscosity and basic gel properties of Black Magic drilling fluids.

Chemical "V" . . . A noncorrosive organic acid which regenerates crude oil-contaminated Black Magic, or increases its viscosity and acid number.

Chemical "X" . . . A liquid oxygenated terpene which reduces the viscosity of Black Magic and makes possible heavy weighting of Black Magic muds.

Formaseal . . . A special air-blown asphalt for lost circulation. It has effective particle-size distribution, and is characterized by slow, but progressive, solubility in crude oil.

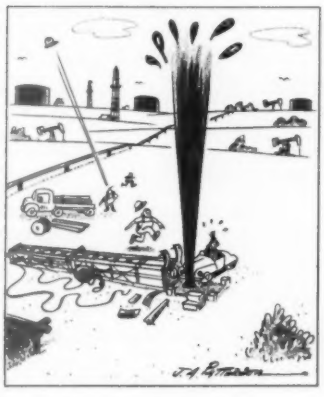
Econo Magic . . . A white powder for mixing with asphaltic-type crude oils (or fuel oils) to produce low weight, low-cost oil-base drilling fluids for use in low-temperature, shallow holes and for workovers in depleted oil sands.

Pepto Magic . . . A white powder for mixing with asphaltic-type crude oils (or fuel oils) to produce an oil-base drilling fluid which will perform as Econo Magic, or may be weighted.

White Magic . . . A readily soluble white powdered material which is added to any regular clay-water mud with crude or refined oil to produce a low-water-loss emulsion mud. This emulsion does not fluoresce and may be used with No-Glo Oil.

OB No-Glo . . . A liquid concentrate containing a colorless nonfluorescent oil along with a nonfluorescent emulsifier to be added to clay-water mud to form a low-water-loss nonfluorescent emulsion.

No-Glo Oil . . . A specially treated liquid hydrocarbon that is colorless and nonfluorescent to be added to clay-water mud, with or without an emulsifier, to form a low-water-loss nonfluorescent emulsion mud. May also be spotted to release stuck drill pipe in wells where fluorescence in the mud is objectionable.



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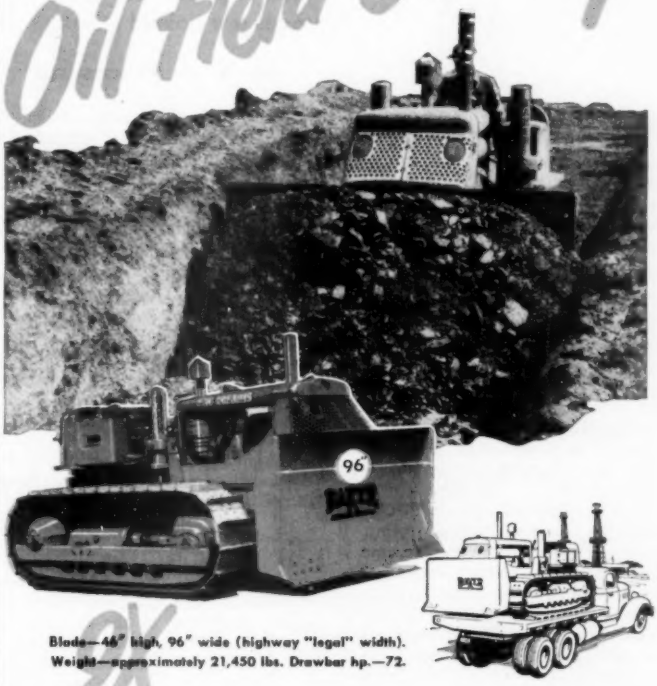

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Graphite's Role as a Drilling-Mud Additive

The material graphite—soft crystalline form of carbon which has a natural affinity for metals—now has use in rotary-drilling mud. Applied as "Graphite-Frecs," some 27 known advantages are gained in rotary-drilling operations.

by A. A. Townsend*

GRAPHITE, a mineral, was used as early as 5,000 years B.C. as a lubricant. It is still used by many industries for that purpose, but its uses have not been extended to any great degree, due to the fact that men do not know the advantages that can be gained through its use.

Graphite has been tested for many uses in the oil industry. Every test has proved beneficial in greater or less degree. These uses will be discussed later.

Properties of Graphite

Graphite is one of the softest minerals. It is a crystalline form of carbon and chemically identical with diamond, which is the hardest of minerals. Graphite occurs in both crystalline flake and amorphous forms. It was originally called lead because it was confused with that mineral. The two do not have any chemical relationship. Graphite resists union with other minerals even at high temperatures. It is used in the manufacture of high-grade steel. For conductivity, it is employed in dry-cell batteries. It is used as brushes in electric motors and other electrical uses.

As a lubricant . . . Graphite has a natural affinity for metals and upon contact will become firmly attached. When graphite is applied to metals, it will reduce the coefficient of friction. Microscopic inspection shows that the graphite will tend to level off roughness of metal surfaces, reducing friction materially. Less friction means less heat, which results in less horsepower and horsepower can be measured in dollars. Graphite will attach itself to any metal surface and cannot be removed unless part of the metal surface is removed.

A surface that has been coated with graphite is called a graphoid surface. A graphoid surface may be defined as an absorbed film of graphite held to the surface of the metal by the surface energy. Adsorption, as applied to the adhesion to a metal surface, might be stated as "the holding of the particles of graphite in contact with a metal surface by molecular forces of a very high magnitude."

Graphite, being a solid which is highly resistant to oxidation and at the same time chemically stable under conditions that are destructive to metal surfaces and impervious to electrolytic corrosion, plays an important part in many unrelated lines of endeavor. Synthetic (artificial) graphite is made from petroleum coke. This transition from petroleum-coke carbon to graphitic carbon is done at a temperature of 3,000° C.

Graphite is stable and for this reason has found its way into many phases of the oil industry.

Graphite in Drilling

Just any graphite will not do for drilling purposes. The graphite must be selected to do the job. After one knows something of the behavior of graphite, it is easy to select the proper grind and type. Type refers to per cent of graphitic carbon. It is mostly natural graphite that is used in the oil industry; however, the synthetic can be used in places such as colloids, paints or other similar phases.

Originally, graphite was not accepted for use in water-base muds because of a lack of affinity for water. Exhaustive field tests in both California and the Permian basin have proved that this characteristic does not adversely effect the lubricative property of graphite. A great saving can be realized by the use of graphite in the drilling of wells when used in the drilling fluid or mud. Numerous laboratory tests have shown that graphite in mud does not impair the properties of the filter cake on the walls of the formation. In many cases, it reduced the water loss through the cake. Graphite should be added to the mud in the same manner that dry chemical compounds are added.

Before a bit is run into the hole make sure the paint is removed, then leave it immersed in a solution of graphite and its carrying agent for an hour or two. The carrying agent should be highly viscous in order to reduce the washing-off action while the bit is being run into the hole.

The following are known advantages gained through the use of graphite in drilling:

1. Increased rate of bit penetration.
2. More footage per bit.
3. Frozen bit bearings reduced considerably.
4. Loss of bit cones lessened. Added life to new chert bit bearings.
5. More full-gage hole, which lessens use of reamers.
6. Less torque required to rotate drill pipe.
7. Less wear on drill collars.
8. Demagnitizer, assists free rotation.
9. Acts as a corrosion inhibitor on all metal parts.
10. Pump and swivel maintenance reduced.
11. Pump volumes increased.
12. Pump pressures reduced at equal r.p.m.
13. Wire-line wear reduced by staying in hole longer.
14. Utilization of horsepower due to less friction load.
15. Washouts kept at a minimum.
16. "Key seats" and "dog leg" hazards are reduced.
17. Water loss in drilling fluids reduced, slightly.
18. A lubricant that will not affect the chemical properties and characteristics of the mud.
19. A lubricant that will not lighten weight of mud.
20. Aeration in drilling mud reduced to practically zero.
21. Dispersion agent for other solids in drilling muds.
22. Erosion is reduced when using weighting materials. The graphite will cover each particle and still allow the materials to be weight effective.
23. On "twistoffs" or "shutdowns" where considerable pipe left in hole, mud will not compact in same manner as it would if no graphite were present. Fishing jobs are performed without washing over. This has been particularly the case in one area where it

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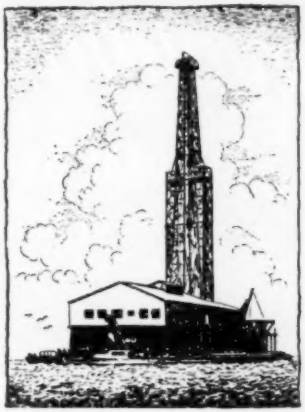

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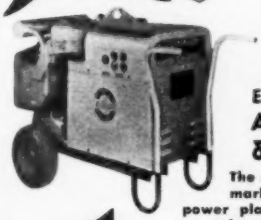

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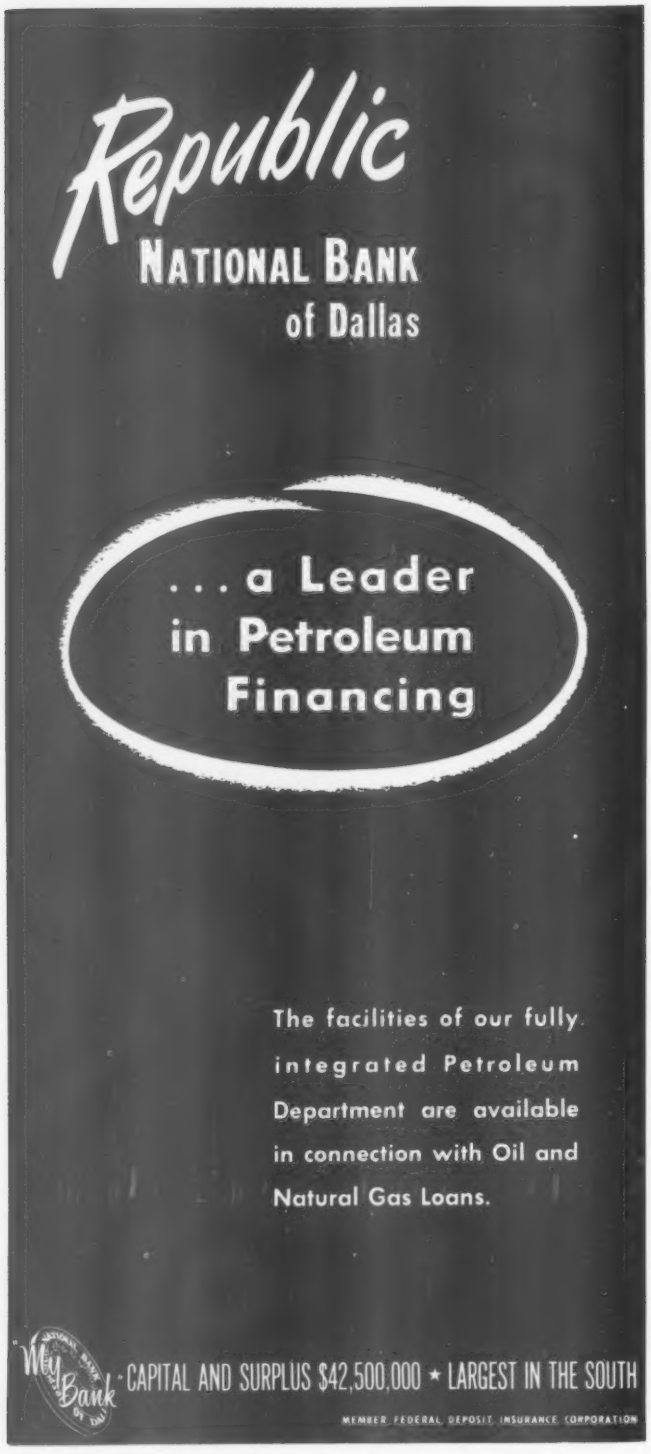
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has always been necessary to wash over when graphite was not used. When it is used, no trouble as yet has been encountered. This type trouble is becoming a thing of the past.

24. No apparent effect on electrical surveys.

25. No effect on fluorescence.

26. Graphite does not hinder visual geology of cuttings and cores. Likewise laboratory core tests are only minutely affected.

27. The most economical lubricant additive for drilling oil and gas wells. The average cost amounts to approximately 1 day's drilling time (in cost) to use the material from 9,000 ft. to a total depth of 13,000 ft. The payout usually appears on the second day when first added at a deep depth. This is common practice because the wells either are "mudding up" for the first time or they have drilled past all incompetent lost-circulation zones.

Graphite laboratory tests, under Graphite-Frecs patents and specifications, were started in 1940 relative to lubrication in fresh and brine water-base muds. Soon the minimum graphitic content of the carbon for maximum efficiency was determined. However, the particle-size range affected the ultimate result. After determining this range while using various mixing and time devices, the particle-size range had to be altered to fit in with standard mixing equipment found on drilling rigs.

Through field tests in California it was noted that in mixing graphite in water-base mud, the time element for mixing directly affected uniform distribution. It was also noted that a good mixture can be had in 37 or higher viscosity mud. Good distribution is independent of the mud weight but patience is essential in mixing graphite in brine-water muds to assure even distribution throughout the mud system.

Thus far, Permian basin field tests show the following results:

Item	No. wells
Wells that used graphite	23
Wells showing good comparative results	12
Wells appearing good without comparison	5
Wells with doubtful results	6
Wells presently using graphite	9

The majority of operators "graphite up" when the rig goes on day time, usually when hard formations are to be encountered. Of the 12 wells showing good results as compared to other wells in their immediate vicinities, the savings realized after 41½ hours using graphite paid for the total cost of graphite added. On these 12 wells the average footage drilled while using graphite was 1,792 ft. The concentration of graphite per barrel of mud averaged 3.9 lb.

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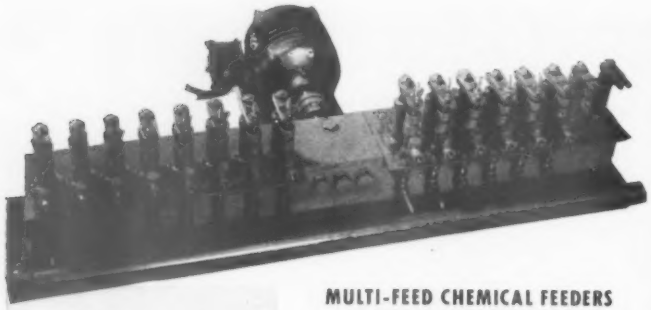

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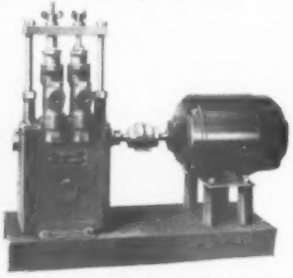

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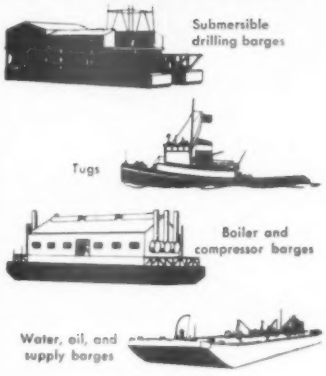
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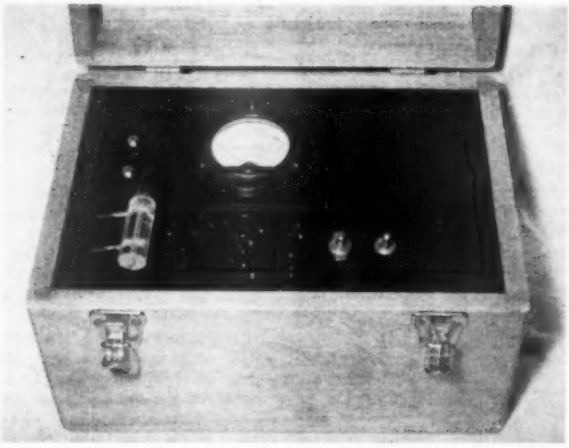


RESISTIVITY METER, developed by Milwhite Mud Sales Co., can be used with extremely small quantities of material—0.6-0.8 cc. Using this meter, the resistivities of both mud and filtrate can be checked conveniently and accurately. The mud-cake resistivity measurements are determined by calculation.

How Drilling Mud Affects Wilcox Drilling and Completions

Here's a case history of a Gulf Coast well, which revealed some important facts to the operator

by Arthur Barry,* Robert Sung,† and David Rowe‡

THE Gulf Coast petroleum industry has become cognizant of the tremendous reserves in the Wilcox formation of Eocene age. However, the characteristics of the sands in the lower Wilcox are such that some operators are reluctant to develop these reserves. The sands in the lower Wilcox have very low permeabilities. Contamination of these sands with undesirable drilling fluids lowers the effective permeability of the sands and in many instances render them impermeable to hydrocarbon production, and therefore the reserves cannot be produced.

Discussion of Problems

The customary procedure followed in drilling wells in the lower Wilcox has included coring of the potential producing horizons. Coring involves considerable added expense in ultimate well-completion costs. Electrical-log interpretations have heretofore been hindered by the invasion of highly resistant mud filtrates, making it impossible to determine the content of the sands with any degree of accuracy. Coring has been more or less necessary to determine the permeability and content of the potential producing horizons.

The cementing problem in the Wilcox appears to be one of lost circulation and channeling. There have been instances where four and five cement stage jobs were necessary successfully to cement the casing above all poten-

*Vice president, New Ulm Corp., Columbus, Tex.; †engineer, and ‡director of research, Milwhite Mud Sales Co., Houston.

TABLE 1—MUD HISTORY—"C. J. MARIK," NEW ULM CORP.

	"P" alkalinity*		Dissolved salts†		Resistivity‡										
Depth	Filtrate	Mud	Calcium	NaCl	Mud¶	Temp. (°F.)	Mud§	Temp. (°F.)	Fil.¶	Temp. (°F.)	Fil.§	Temp. (°F.)	Cake¶	Temp. (°F.)	Cake§	Temp (°F.)
8,300	5.1	19.0	600	13,500	.24	112	.14	200								
8,464	5.0	20.5		15,000	.22	115	.13	200								
8,600	3.9	19.5		14,000	.23	108	.14	200								
8,807	3.9	25.0		19,500	.21	114	.12	200								
9,027	4.2	25.5	750	21,000	.22	110	.13	200								
9,070	3.8	26.5		18,000	.20	108	.11	200								
9,192	4.1	28.0		18,900	.23	96	.11	200								
9,240	3.8	26.3		18,000	.23	106	.14	200								
9,325	4.4	29.0		18,200	.20	117	.13	200								
9,357	5.4	31.5	930	18,300	.23	95	.13	200	.12	100	.054	200	.26	100	.13	200
9,391	3.1	44.0		15,000	.23	107	.14	200								
9,457	3.5	44.5	860	16,700	.22	112	.12	200	.125	100	.06	200	.27	100	.14	200
9,463	3.4	41.0	960	16,500	.26	87	.12	200	.11	100	.05	200	.24	100	.12	200
9,484	3.8	28.0		18,200	.22	112	.13	200								
9,662	3.0	29.5	850	16,500	.25	98	.15	200								
9,740	2.0	29.5		15,300	.24	105	.16	200								
9,795	3.5	30.0	1,100	15,000	.23	110	.14	200	.12	100	.054	200	.28	100	.13	200
10,000	3.5	30.0	1,100	15,000	.23	112	.13	200	.13	100	.065	200	.27	100	.14	200
10,098	3.6	30.0		14,200	.24	100	.15	200								
10,171	4.0	30.5		16,500	.23	110	.14	200								
10,219	3.8	30.0		15,600	.23	108	.14	200								
10,295	4.0	31.0	1,000	16,800	.24	107	.15	200	.125	100	.06	200	.27	100	.14	200
10,415	3.8	31.0		12,200	.27	112	.19	200								
10,460	2.8	35.5		15,000	.25	107	.18	200								
10,472	3.4	34.0		15,800	.27	117	.19	200								

*Phenolphthalein end point of 1.0 cc., titrated with 1/50 N sulfuric acid. †In parts per million. ‡In ohm-meters. §Resistivity corrected to approximate bottom-hole temperature of 200° F. ¶Resistivity at observed temperature in °F. By calculation.

tial producing formations. The causes of this problem are believed to be twofold: (1) Heavy cement slurries, and (2) flocculation of ordinary mud by cement contamination (thereby increasing the tendency to break down the formation caused by excessive pump pressures.).

The completion or reworking of a well in the Wilcox, generally speaking, has been a risky and uncertain operation.

There are many cases on record where wells have been drilled and open-hole tested to indicate a potential producer; yet when the actual completion took place, it was found that either the well did not come in at all or was very slow in cleaning up. As a matter of fact, it has been the exception rather than the rule for wells to come in without acidization or trouble of any kind.

Water blocking . . . The history of these troublesome wells indicates that waterblocking is the major problem. The Wilcox sands are predominantly imbedded with a very fine silt, bentonitic in nature. It is believed that once this silt is exposed to the fresh-water filtrate of the drilling mud, it hydrates and expands to such an extent that production from that sand is greatly retarded.

Filtrate loss . . . The nature of the drilling mud employed in drilling and completing wells in the lower Wilcox has to include low-filtrate-loss properties and also low resistances. The filtrate losses have to be determined at reservoir conditions of temperature and pressure in order to be of any material advantage. Filtrate losses determined at atmospheric conditions only give a comparative figure and are very misleading.

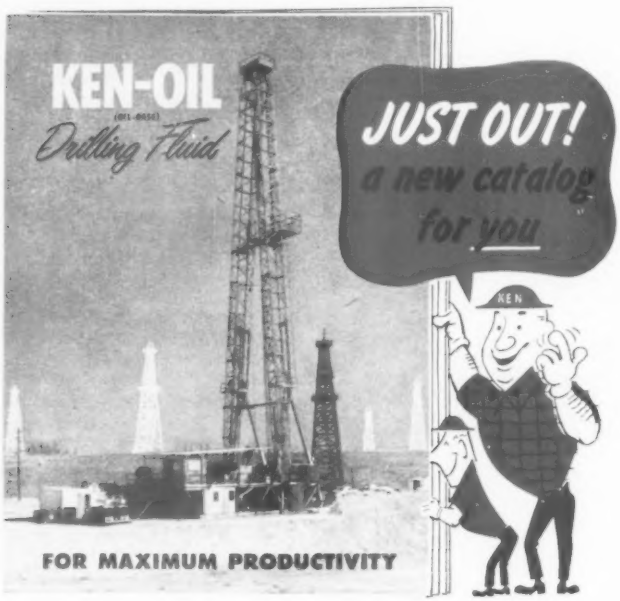
For logging, the mud resistances have to be corrected to reservoir temperatures, and depend primarily on the salinity of the mud. The actual mud resistivity at bottom-hole conditions should be obtained from the MicroLog, since it does not necessarily correlate with resistivity of saline solution at high temperatures, as obtained from International Critical Tables.

An Actual Case History

New Ulm Corp. decided to use such a mud when drilling its C. J. Marik.

Prior to the drilling of the C. J. Marik well in New Ulm field, several types of mud were considered. These muds were considered on the basis of low filtrate losses at high temperatures and pressures, low resistances, composition of filtrates, and the contaminating effect on lightweight cement slurries. Previous laboratory work had concluded that the polyvalent salts in aqueous solutions are more effective than the monovalent salts (sodium chloride) in preventing permeability impairment of the sand. Since the resistivity of the mud depends on the saline content, sufficient calcium had to be present in the filtrate to minimize the decrease in effective permeability. A Kembreak lime mud with a resistance of .10 to .20 ohmmeters at 250° was decided on as the drilling fluid which would more nearly conform to all the desirable characteristics. The Kembreak lime mud would withstand greater concentrations of salt, carry higher concentrations of the polyvalent calcium, and would not be affected by contact with cement.

The subject well was drilled with Kembreak lime mud from the top of the Wilcox section to total depth. All potential producing horizons were cored and analyzed in order to compare the results obtained with the electrical log. Core analyses revealed that the filtrate invasion was practically nil, substantiating the assumption that the filtrate losses were not increased appreciably under high temperatures and pressures. The characteristics of the



READY FOR IMMEDIATE DELIVERY this catalog shows how to insure greater productivity and longer life of oil and gas wells by using KEN-OIL (oil base) Drilling Fluid and KEN-PAK Casing Protector. Four fact-packed pages explain the advantages, applications and savings achieved by use of KEN-OIL and KEN-PAK.
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Petroleum Industries Consultants C.A., Apartado 1953, Caracas, Venezuela.

mud in drilling from 8,300 to 10,472 ft. ran in this order:

Weight	10.1-10.5
Funnel viscosity	45-55
Stormer viscosity	20-35
Gels, 0-10 minutes	0-5
Filtrtate, 30 minute A.P.I.	5.5-6.5
Cake, 32nd in.	1.5-2.0

Electrical - log interpretations were made independent of core analyses and conflicting interpretations were tested. Formation tests proved the reliability of the log interpretations.

The history of the mud used in C. J. Marik is as follows: The system from surface down to 8,300 ft. was a sodium base mud treated with MilGel, Oilfos, and Ligco. A funnel viscosity of 40-45 seconds A.P.I. was maintained with a natural mud weight of 9.8 - 10 lb. per gallon and a fluid loss of 8.0 cc.

The system was broken over to a Kembreak lime system at 8,300 ft. to which salt was added until the resistivity was lowered to the desired values. This required approximately: 3 lb. per bbl. Kembreak; 10 lb. per bbl. lime; 1.5 lb. per bbl. caustic; 5 lb. per bbl. Milstarch; 6 lb. per bbl. salt. The mud characteristics from 8,300 ft. to total depth are listed in Table 1.

The salinity of the mud decreased with increased depth. This was allowed because the bottom-hole temperature increased and resulted in a decreased mud resistivity.

One problem encountered when drilling previous wells in that area was that of combating natural mud weight and viscosity. The silt in the Wilcox, when drilled, hydrates and makes mud to such an extent that very large quantities of water are required in order to maintain a drilling mud with suitable weight and viscosity. It is noteworthy that, when drilling the C. J. Marik, very small additions of water were necessary and practically no thinning agents were needed.

The mud weight remained very constant except when the pits were gunned so deep as to stir up the silt and sand which had settled. The relatively high concentration of calcium and sodium chloride in the filtrate did not allow the silt to hydrate. Therefore, the silt settled out of the drilling mud as an inert.

Reversible scratchers and spiral centralizers were used on the producing casing string, with scratchers placed at 15-ft. intervals and centralizers spaced on 90-ft. intervals, in order to cover a 2,000-ft. cement column. Circulation was broken at 3,000, 8,000, and 10,400 ft., and allowed to continue until the mud was pumped around. Casing was reciprocated during the pumping procedure. At this point the viscosity of the mud did not vary, as was experienced in prior cementing jobs using emulsion muds.

Cementing . . . A lightweight admix cement slurry weighing 12.5 lb. per gal. was used. This slurry consisted of 10 per cent bentonite, .75 per cent Kembreak, and 3 per cent expanded perlite in common portland cement. This was used to prevent lost circulation which was previously experienced. The cementing job was very successful and eliminated squeezing entirely.

The operation indicates that the Kembreak lime low-resistance mud used in the C. J. Marik well is a step toward the economical development of lower Wilcox reserves. Total well costs were reduced 21 per cent below the average of the last six wells drilled in the field.

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Milflake . . . Pure wettable cellophane chopped.
Milgel . . . Pure Wyoming bentonite.
Milstarch . . . A pregelatinized starch.
Milwhite Salt Water Clay . . . A zeolitic clay.
Mobar . . . Pure Missouri barite.
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Workover Clay . . . A compounded 10-lb. per gal. low viscosity and low water loss.

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How Does the Drilling Contractor Regard Oil-Base Drilling Fluid?

Use of oil-base drilling fluid has as one of its primary objectives obtainment of better well completions, thus increasing oil recovery from the producing horizon.

by Keith B. Bright*

DRILLING contractors drill the great percentage of oil wells today in the United States and this percentage is increasing every year. The reason must be that the drilling contractor can drill the wells cheaper and possibly better than the operators themselves.

But there is more to an oil well than just drilling a hole in the ground free of trouble. The well is drilled primarily to obtain oil or gas; therefore, greatest consideration must be given to drilling the producing horizon. In former years, little thought was given to completion practice by the operators and less by the contractor. The objective was to drill the well and get it on production.

It has become more and more apparent in recent years that damage was done to the producing horizon while drilling it. Many special types of drilling fluids were developed to combat this problem. Most of them had as their base a clay-water mixture with some additive to control the loss of water filtrate to the producing horizon. This was indeed a great step forward over the days when practically clear water and sand was used as a standard completion fluid.

Many operators used crude oil to drill their producing horizon when it was possible to do so. However, the application in general was limited only to very low-pressure zones and to those zones which did not give trouble from running sand or sloughing shale. Frequently, serious trouble developed from the inability of the oil to carry weight material.

Various oil companies and service companies during the past 12 or 15 years have devoted considerable time and expense to the development of satisfactory oil-base drilling fluids, the thought being that if a fluid could be developed having an oil filtrate and with all the other characteristics necessary to a good drilling fluid, such as good wall-building ability, gel strength to support weighting material, viscosity control, etc., the damage heretofore experienced by the use of water-base drilling fluids to the producing zone would be eliminated.

*Vice president, Ken Corp., Long Beach, Calif.

Meaning to the Contractor

What does all this mean to the contractor? He is the one whose equipment must be used in drilling the well using oil-base drilling fluid and his personnel must be the ones that work with the oil-base drilling fluid and, in a great part, have supervision over it. From the mechanical application, which generally the contractor is primarily interested in, the use of oil-base drilling fluid should not cause him any great concern. Since the development of oil-resistant rubber for pumps, rotary hoses, blowout preventers, and drill-pipe protectors, these pieces of equipment will give as long service in an oil-base drilling fluid as the natural rubber did in the water-base-type muds.

The increasing use, by the contractors, of steel pits with mud guns, and the use of shakers as standard equipment take these items from the list of special equipment necessary for an oil-base job. This leaves only about one very minor piece of equipment needed on an oil-base job, namely, a drain pan to stand the drill pipe in so that the oil-base drilling fluid can be drained back into the pit and not over the rig floor. It might be conceded that an oil-base drilling fluid, can be messy unless proper housecleaning is maintained. If each crew contributes to a clean rig, this inconvenience can be virtually eliminated. It is only on those rigs where poor housekeeping is practiced that any mess due to the oil-base drilling fluid is noticed.

The operators are primarily interested when they drill a well in getting enough production to make a profit, not in merely getting enough production to pay the cost of drilling. A good many of the fields in the United States are approaching the point where it is almost uneconomical for the operator to drill a well unless increased production can be obtained. By the use of oil-base drilling fluid many more wells are being drilled in fields of this category.

The impression should not be created that in every case where oil-base drilling fluid is used the production will be greatly increased, but if an oil-base drilling fluid, such as Ken-Oil, is used under those conditions, such as dirty sands, low-pressure sands, tight sands, some lime formations, and in possibly some of the fractured horizons, enough increase in production will be noted to warrant further drilling.

The reluctance by some of the contractors to accept the use of oil-base drilling fluid has been in a great part brought about by their early experiences with it where heating equipment had to be on the location to mix the material; where some of the material used, such as lamp black, was extremely disagreeable to the personnel involved; and, as before mentioned, there was a detrimental effect on the natural rubber used in the pumps, etc. Like any other product, advances have been made so that now the mixing of the oil-base drilling fluid can be extremely simple.

Drilling time is of very great importance to the contractor. From our experience we can say that on the average the penetration rate (this is considering all types of formation) will be approximately 80 per cent of a water-base drilling fluid, but the bit life while using the oil-base drilling fluid will be extended and more hours on bottom will be experienced when an oil-base mud is being used. Consequently, the total time to drill a given interval can be approximately the same as that of a water-base mud. In some formations where bits tend to ball up with the use of water-base mud, this trouble can be eliminated with oil-base drilling fluids. Sand, in general, drills at about the same rate with oil-base as with a good water-base mud, but in all cases the bearing life of the drilling bits will be extended. The abrasion and wear on drill pipe will be cut considerable.

Glossary—Products of Ken Corp.

Ken-Oil Concentrate . . . A liquid material which when added to the proper crude or fuel oil results in Ken-Oil Base drilling fluid.

Ken-Pak Concentrate . . . A liquid material which added to the proper crude or fuel oil, results in Ken-Pak.

Ken-Oil . . . An oil-base drilling fluid.

Ken-Pak . . . A high-gel-strength oil-base material used to prevent casing corrosion, to insure recovery of casing, and to prevent damage to casing due to earth movement.

Billion dollar blowout

It happened at Hull, Texas, in 1922. A young contractor by the name of *Jim Abercrombie* was re-working a well when it blew out and caught fire. As he watched his hard-won equipment being destroyed, he resolved to do something about this menace that had begun to stalk the struggling young oil industry. Soon, from his newly acquired "repair shop" . . . *Cameron Iron Works* . . . came the first crude model of a ram-type blowout preventer. This was the grand-daddy of the now famous pressure-operated Cameron Blowout Preventers which have become a byword in the oil fields. Their savings to the industry are already inestimable . . . *perhaps a billion dollars or more* . . . considering the valuable reservoir pressures, costly well bores and machinery and the conservation of tremendous quantities of oil and gas. So, an event which might have passed as just another blowout in the roaring twenties actually sparked the development of the Cameron line of drilling and completion control equipment that is now regarded as the standard of comparison the world over.

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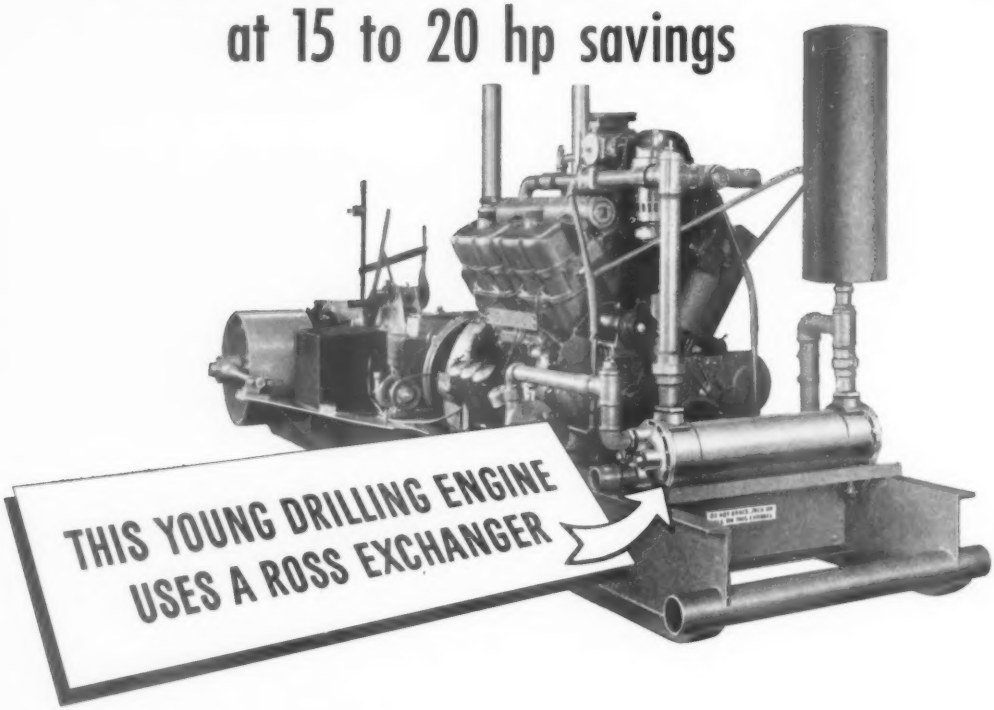

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Had Young Engine Corporation, its maker, used a customary radiator and fan to cool the jacket water of the 8-cylinder Le Roi gasoline motor which powers this equipment, from 15 to 20 hp would be consumed. The customer, a well known eastern natural gas company, felt that this power loss could not be afforded.

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. . . readily mixed into drilling using hopper attached to mud suction pipe; crinkled surface aids rapid dispersal.

Restores Lost Circulation

by Guy F. Williams*

ONE of the most persistent, and often most costly, problems encountered in drilling wells is that of lost circulation. This is a hazard wherever rotary tools are used, and is often the forerunner of serious blowouts, stuck drill pipe, difficult fishing jobs, increased completion costs, and, in some instances, loss of the well.

The bridging and wall-building properties of drilling mud are sufficient, under most circumstances, to limit fluid loss into the formation being penetrated. However, when a highly porous and permeable thief formation is encountered, the mud is unable to build up an effective, impermeable mud cake, and large quantities of the mud can be lost into the formation in a short time. The extent of this loss depends on a number of factors, such as the size of the mud particles, the viscosity and weight of the mud, its wall-building properties, the hydrostatic head of fluid in the hole, and, of course, the permeability and pore size of the formation.

Lost circulation is most prevalent in deep well drilling. The increase in mud weight necessary for the control of abnormal formation pressures or hot salt-water flow zones produces a greater hydrostatic head, often resulting in a breakthrough of the mud cake. These zones of lost circulation are either low-pressure, porous sections, or strata which withstand ordinary pressures but which may be distributed or uplifted by the increased mud weight, or pump pressure.

Control of mud circulation is particularly important in that it determines the size of the well bore. If it is necessary to set pipe in order to continue drilling, not only is the cost of the pipe a factor, but also the reduced size of the continued hole. Where several thief zones are encountered, the restriction of the hole size can become critical, especially in the event of tool failures and subsequent fishing operations. As a result, the setting of casing is avoided except as a last resort.

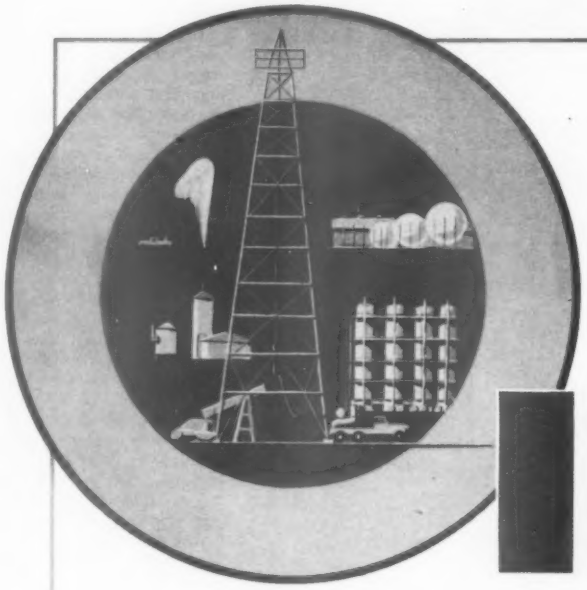
In cases where mud losses are comparatively small, a slight increase in the viscosity of the mud without increasing the gel strength may be sufficient to establish normal drilling operations. In more severe instances, however, chemical conditioning of the mud is not sufficient to restore circulation. Then, the usual procedure is to add special addition agents to the mud that will mechanically plug the openings taking the drilling fluid.

Different Lost-Circulation Agents

A large number of different materials are employed as lost-circulation agents, such as cotton-seed hulls, grains, wheat bran, chopped-up hemp rope, or wood shavings. In some cases these materials will plug the formation sufficiently to restore circulation. Usually, however, a quantity of mud will be lost throughout the remainder of the drilling operation.

One of the most successful addition agents for combating lost circulation is Jelflake, a cellulosic foil material with extraordinary surface area per unit weight. It has high strength, even when wet, and is chemically inert to drilling mud, oil, brine, cement, or bacterial action. This plastic foil is precut into graded particle sizes, ranging from ⅛ in. up to 2 in. size. Because of their extreme thinness, .0001 in., the flakes are flexible and pliant,

*Dowell Incorporated, Tulsa.



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enabling them to plate out over rough and irregular surfaces.

These flakes are treated by a special chemical process in order to give them a crinkled surface. This property allows them to be readily dispersed into mud or other well fluids without balling up, or incomplete wetting of the material. Their specific gravity is such that the flakes remain dispersed and in suspension indefnitely, and they do not clog pump valves or circulating equipment.

Many lost-circulation materials of natural origin (shredded fibers, leather, bark, etc.) release tannic acid when placed into suspension in drilling mud. This acid has the effect of thinning down the mud, requiring additional conditioning agents to restore the desired viscosity. The chemical inertness of Jelflake prevents any viscosity loss through reaction with the mud, as it is completely unaffected by the high temperatures sometimes encountered in deep wells, or any of the chemical additives normally used in drilling muds. At the same time, the cellulose flakes are not softened or disintegrated by contact with the mud, retaining their strength and protective properties over long periods of time. Jelflake does not absorb water, brine, or oil and consequently does not affect the mud-viscosity, nor swell to any appreciable extent when in contact with these fluids during drilling.

In application, as the foil-laden mud contacts with the porous zone, the flow of fluid into the zone will deposit the particles of foil against the formation face. These graded particles are drawn into and bridge over the openings. The wall of the formation is soon plastered over and the pores plugged with the foil fragments, forming an impervious filter cake, capable of withstanding high pressure differentials.

While certain specific amounts of Jelflake have been recommended for use in drilling fluids, these amounts are not critical and may be altered to meet specal conditions. Normally, the ratio ofJelflake to drilling mud is from 2½ to 5 lb. of Jelflake per barrel of mud. In extreme cases, as high as 30 lb. of Jelflake per barrel of mud have been used, the increased Jelflake loading adequately handling very difficult circulation problems.

The mixing of Jelflake with drilling mud does not require any special equipment or elaborate techniques. It is advisable to add the material to the mud by means of a hopper attached to the mud suction line. If colloidal material or mud-conditioning agents are being added to the mud at the same time as the foil flakes, a separate hopper should be used as a combination of these materials tends to plug the hopper. Another method often used is to apply the cellulosic foil material to the mud pit near the mud suction pipe, using a mud gun to obtain thorough mixing. Where this type of application is used, it is desirable to raise the mud suction pipe to within a few inches of the surface of the pit so that the foil-laden mud first reaching the porous section in the well will permit more rapid plugging of the thief zones.

It has been observed that successive concentrated slugs of Jelflake (3 to 5 lb. per barrel of mud) provide better results than a more uniformly distributed application, especially in those wells where circulation has been lost. In such cases, a heavy concentration of the cellulose foil enters the zone of loss, plugging and plastering until all the pores taking fluid are filled. A good practice, based on field experience, is to gage the displacement of the drilling fluid. Then, when the portion of the mud carrying the flakes starts clearing the bit, the mud pumps should be slowed down, or even stopped entirely. This appears to give the foil flakes a better chance to filter out of the mud at its point of entry into the formation without the delaying handicap caused by the action of the pumps on the mud.

The application of Jelflake is not limited to wells that have already lost circulation. It is frequently employed as a preventive measure in fields with a known history of lost-circulation difficulties, or where experience on other wells has already located the zones of probable mud loss. In such cases, a concentration of approximately 2 lb. of foil flakes per barrel of mud provides considerable insurance against circulation and mud losses. Once the troublesome zone has been passed and sealed, the residual foil material may be recovered by passing the mud returns over a shale shaker. Any shale or other material collected by this procedure may be washed away with water. In many instances, foil flakes have been used as many as three times with good results.

It should be pointed out that this material cannot be considered as a cure-all. When extremely severe losses are encountered, as in fissured or cavernous formations, no amount of lost-circulation agent will suffice to restore circulation. In such cases, the only recourse is to set casing before continuing drilling.

Another application for Jelflake has been in connection with cementing operations, for example in Illinois where highly permeable formations are encountered above the oil-producing horizons. In wells of this type, great difficulty has been experienced in maintaining circulation during drilling, also later when attempts are made to place cement behind the pipe to points high enough to protect the upper productive zones and prevent possible migration of oil and water.

By mixing Jelflake into the slurry, losses into the formation are minimized and a better cement job is made possible. Temperature surveys on wells that have been completed with cement containing Jelflake, showed the cement column to have risen to a higher level behind the pipe than in nearby wells where Jelflake was not used.

Jelflake is an ideal addition agent for cement slurry because it is light in weight, yet high in permanent strength; it does not ball up or accumulate while mixing; it exhibits a large surface area, is flexible, and does not affect appreciably any of the physical or chemical properties of the cement. It has negligible effect on the initial set of the slurry and, consequently, on the length of time during which it can be pumped. It does not absorb liquid from the slurry, which might cause premature or "flash" setting of the cement. The usual amount used in such application is from ¾ to 1 lb. of Jelflake per sack of cement.

Some Typical Case Histories

Gulf Coast No. 1 . . . The drilling operator on a Louisiana well regained 100 per cent circulation, using 500 lb. of Jelflake, where an offset well was unsuccessful, using almost a carload of mica flakes. This well was losing circulation at 8,135 ft., just 100 ft. short of contract depth. The operator had just started coming out of the hole to change bits when circulation suddenly stopped altogether. The kelly was then put on and circulation was restored. However, it was decided to finish the round trip and put on a safety joint.

When the pipe was back in the hole, the pumps were started but circulation could not be restored. After 300 bbl. of mud had been lost, 200 lb. of Jelflake was added to the mud, in a ratio of 5 lb. per barrel, and spotted on bottom. The pumps were shut down for 10 minutes and then started up again. As no returns were obtained, an additional 300 lb. of Jelflake was spotted on botttom, and the pumps then were shut down for 20 minutes while a new pit of mud was mixed. Following this, the pumps were started but, after 10 minutes, reports still had not been obtained. The driller then tried wo.'king the pipe up and down, as far as he could with the kelly on. After doing this several times, the mud finally began to trickle over on the upward trips, as the pipe was being worked. Each time the pipe was picked up, the flow became stronger until, 15 minutes after the first mud showed up, 100 per cent returns were obtained.

Gulf Coast No. 2 . . . At another location, a deep test well was being drilled. More than

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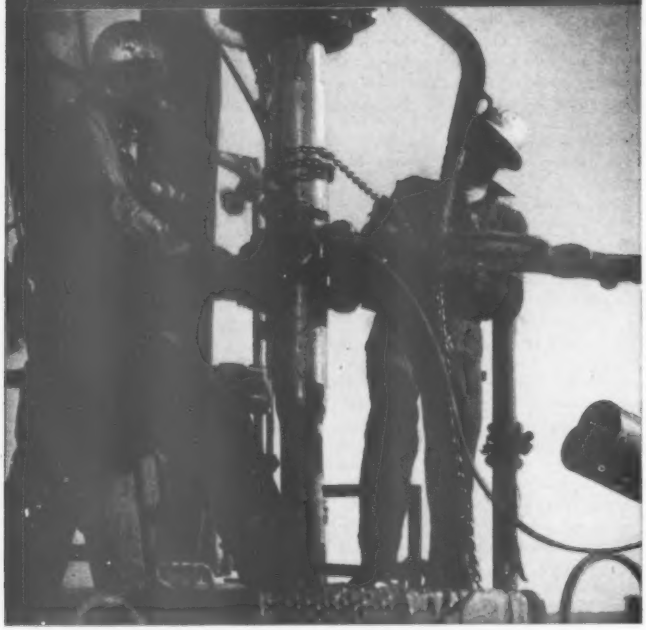

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a mile below the surface, a strong salt-water flow was encountered. In order to control the high pressures, it was necessary to increase the weight of the drilling mud. As a result of the increased hydrostatic head of the fluid, circulation was lost.

In this circumstance it was essential that the mud weight be kept to a maximum to prevent a blowout, and the operator was faced with running a string of pipe before drilling could be continued. Before shutting down until the necessary pipe could be obtained, it was decided to try a lost-circulation agent, even though little hope was held for its success. In this instance, Jelflake was so effective that circulation was restored drilling resumed, even with the heavier mud column.

Kansas . . . A "Central Platform" well had been drilled to a depth of 810 ft. At that point, the drilling fluid began to escape into a porous formation and 3 tons of mud was lost in a very short time. Five thousand pounds of cotton-seed hulls were employed, but the loss of mud continued. Circulation finally was reestablished through the addition of only 150 bbl. of Jelflake. Drilling then continued to a depth of 3,555 ft., and the well was completed satisfactorily without further losses.

Texas . . . The example well was drilling at 6,440 ft., when the mud commenced to escape rapidly, and 24 tons of mud was quickly lost. Twenty tons of cotton-seed hulls was immediately added to the pit, and the entire pit of mud pumped into the well, without restoring circulation. A new pit of mud, then containing 300 lb. of Jelflake, was prepared. Circulation was restored as soon as the Jelflake-laden mud reached the porous zone.

Illinois . . . While drilling one interesting well, 4 tons of bulky filler materials and two complete pits of mud had been pumped, with no returns. Two hundred pounds of Jelflake then was added by hand to a pit of mud, and pumped down the well. Circulation of the Jelflake-laden mud for 1 hour brought full returns. When the pumps were stopped, the fluid level remained constant.

Louisiana . . . Two attempts to drill through a high-pressure, salt-water-flow formation on the Louisiana Gulf Coast proved unsuccessful and very costly, using conventional materials and technique. Prior to the third attempt to drill through this formation, casing was run to a depth of 9,800 ft. and cemented, the salt-water flow being anticipated between 10,000 and 11,000 ft. Following this, a special starch mud was prepared of high weight, low viscosity, and with gel characteristics capable of withstanding relatively high salt-water concentrations.

The formation began taking 15.4 lb. mud at 10,200 ft. As it was believed that 16-lb. mud would be necessary to drill through the flow, not yet encountered, it was decided to cement off the thief formation. When pressure sufficient to raise the cement to the proper level behind the pipe could not be obtained, Jelflake in the amount of 1½ lb. per sack of cement was introduced at the suction pan and pumped into the formation, promptly securing the necessary plugging action.

After this operation, it was possible to increase the mud weight to 16 lb. Then, slightly below the thief formation, the salt,-water flow was encountered and returns again were lost. The mud weight was reduced .2 lb., and 2 lb. of Jelflake per barrel of mud was introduced. Circulation was regained, and drilling continued successfully to a total depth of 12,247 ft.

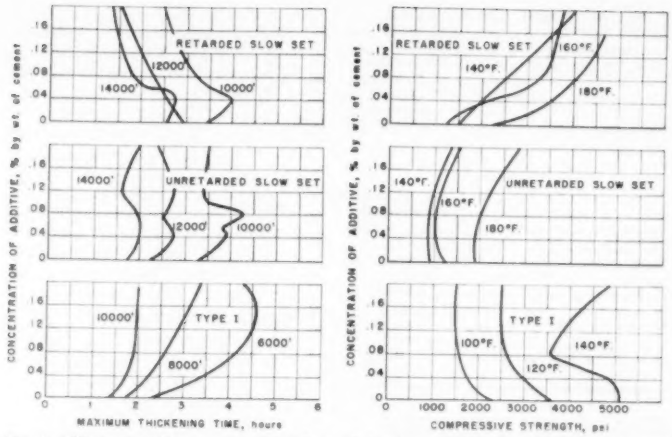

Fig. 1—Effect of sodium hexametaphosphate (Calgon) on maximum thickening time and compressive strength (A.P.I. Bull. D-4).

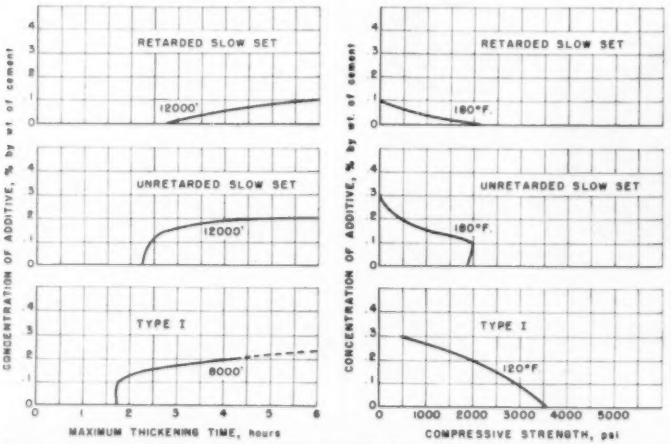

Fig. 2—Effect of quebracho on maximum thickening time and compressive strength (A.P.I. Bull. D-4).

Effect of Mud-Treating Chemicals On Oil-Well Cements

Inorganic chemicals tend to be erratic in effect, but not serious enough to be considered appreciably detrimental

by Francis M. Anderson*

PRIOR to 1940, very little difficulty was encountered with drilling-fluid treating chemicals affecting the setting of oil-well cements. During that period most drilling muds were composed of natural earth clays and minerals plus relatively small additions of bentonite and treating chemicals for viscosity and gel-strength control. In relation to these drilling muds, practically all of the study pertaining to cement was in combating the flocculating effect of cement on the drilling mud. A great amount has been written on the proper chemical treatment to counteract this, but to date very little has been written on the effect of the treated drilling fluids on oil-well cements.

After 1940, oil-base and emulsion drilling fluids were introduced. At the same time, intensive research was begun on treating chemicals and additives resulting in new and improved types of water-base drilling fluids. The so-called "red muds" were introduced which contained large amounts of caustic and quebracho. This was followed by lime-base drilling fluids containing high concentrations of lignin compounds, quebracho, lime, and other materials. During this period organic colloids such as gums, starches, and cellulose products were brought into prominent usage.

Setting of Oil-Well Cements

The advent of these highly treated drilling fluids was followed by complaints of oil-well cements not setting properly. Cements that were normally hard in 12 hours would often require 36 hours or more to set or would reportedly not set at all. A survey revealed that these reports were usually on cementing jobs performed in wells drilled with highly treated drilling fluids, with a large percentage of them following lime-base drilling muds containing lignin and starch. This indicated a need for a laboratory study of the effects of mud-treating chemicals on oil-well cements.

A study of this problem in 1948 revealed that most of the sodium alkalies and phosphates used in treating drilling fluids had no drastic effect on cement when used in concentrations likely to be encountered from contamination in oil wells. In general these compounds were quite erratic in their effect on cement, tending to shorten the setting time under some conditions and lengthen it under other conditions. Compressive strengths of most cements were also affected somewhat erratically by these compounds. However, in no case was the setting time or early strength of the cement changed to the extent that it would seriously affect the results of a cementing job.

Quebracho was found to be a very drastic retarder for oil-well cements. As little as 5 per cent contamination with a drilling fluid containing 1.0 lb. of quebracho per barrel was sufficient to reduce the 24-hour strength of one slow-setting oil-well cement from 3,700 psi. to zero and the cement was still unset at

*Assistant laboratory manager, Halliburton Oil Well Cementing Co., and chairman, A.P.I. Mid-Continent District Study Committee on Oil-Well Cements.

the end of 3 days at 180° F. Most cements required larger amounts of contamination before setting was inhibited for as long as 24 hours.

The A.P.I. Mid-Continent District Study Committee on Cementing Practices and Testing of Oil-Well Cements became interested in this project and carried out a rather extensive program covering the following compounds:

Carbonox and caustic, caustic-quebracho, Kembreak (calcium ligno-sulfonate), quebracho, sodium acid—pyro-phosphate, sodium carbonate, sodium carboxymethylcellulose, sodium hexameta phosphate, sodium hydroxide, sodium palconate, sodium silicate, starch, and tall-oil soap.

Tests were conducted to determine the effect of each chemical on (1) a retarded slow-setting cement containing a chemical retarder, (2) an unretarded slow-setting cement containing no chemical retarding additive, and (3) A.S.T.M. Type I cement. One set of tests was made by treating a drilling fluid composed of only water and bentonite with various amounts of the compounds and then contaminating cement slurries with these treated muds. The effect of these treating compounds on the consistency and thickening time of the cement slurries was determined as well as their effect on the 24-hour strength of the set cement.

The results of these tests were published by the American Petroleum Institute, Division of Production, Dallas, as a special bulletin (A.P.I. Bulletin D-4, "The Effects of Drilling-Mud Additives on Oil-Well Cements") in September 1951. This bulletin is suggested reading for those wishing to pursue this subject in more detail than is presented here. These results corroborated the earlier findings and added significant new information to the existing knowledge of the subject.

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An example of the erratic behavior of sodium phosphates is illustrated graphically in Fig. 1 showing the maximum thickening time and 24-hour compressive strength with various amounts of sodium hexametaphosphate. The thickening or maximum pumping time of Type 1 cement was increased with all concentrations of the additive and at all three test conditions. The time to 70 poises (maximum thickening time) was approximately twice as long with 0.16 per cent sodium hexametaphosphate as with neat cement when simulating 6,000-ft. well conditions,* indicating a decided retarding action.

The thickening time of the unretarded slow-setting cement was affected differently by different concentrations of the additive with the general trend being a retardation effect. Conversely this same additive had a decided accelerating effect on the retarded slow-setting cement.

The effect of this chemical on the compressive strength of Type 1 cement was a reduction of approximately 25 per cent, whereas this same material increased the strength of the retarded slow-setting cement more than 100 per cent. The strength of the unretarded slow-setting cement was affected less by this particular additive.

Somewhat similar erratic results were obtained with the following chemicals:

Sodium acid pyrophosphate, sodium carbonate, sodium silicate, tall-oil soap, and sodium hydroxide.

Although the above chemicals produced unpredictable results on cement slurries, in no case, according to the mud-contamination tests, was the cement affected to such an extent that the resulting properties were unsatisfactory for use in oil wells with the exception of sodium hydroxide.

Sodium hydroxide (caustic soda) acted as a retarder in concentrations up to 0.5 per cent by weight of the cement with two of the cements, but drastically shortened the thickening time when more than 1 per cent was added. The unretarded slow-setting cement was accelerated throughout the range of concentrations.

Fig. 2, showing the effects of quebracho on the thickening time and compressive strength of the three types of cement, is a typical illustration of the effects of treating chemicals having drastic retarding action on the setting of cement. One tenth of 1 per cent quebracho was sufficient completely to inhibit the set of the retarded slow-setting cement for more than 24 hours at 180° F. Three-tenths of 1 per cent inhibited the set of the unretarded slow-

*All tests were conducted in accordance with the procedures designated in A.P.I. Code 32, "Code for Testing Cements Used in Wells."

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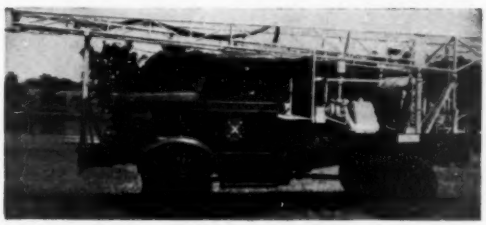

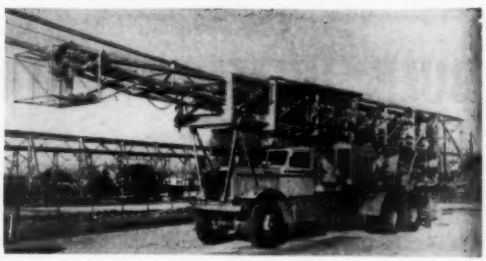

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setting cement and reduced the compressive strength of the Type 1 cement to about 400 psi. in 24 hours. Other tests have shown the setting of cement can be inhibited for days with quebracho in the amounts of 0.5 to 1.0 per cent by weight of the cement.

The retarding action of this type of chemical increases the available handling time of the fluid cement slurry, thus the change in thickening time is of no serious consequence. The inhibition of the setting of the cement is, however, of major importance.

Similar results were obtained with caustic and quebracho (one part caustic to one part quebracho) indicating the retarding action of the quebracho is stronger than the accelerating action of the caustic.

The chemicals tested by the A.P.I. committee which had serious retarding effects on these cements were:

Carbonox and caustic, quebracho, calcium ligno-sulfonate, sodium carboxymethylcellulose, sodium palconate, starch (pregelatinized).

A study of the foregoing drilling-fluid treating compounds reveals that the inorganic chemicals in general tend to be somewhat erratic in their effect on oil-well cements but are not serious enough to be considered appreciably detrimental. The organic chemicals in general produce much more drastic reactions, completely inhibiting the set of the cement in many instances. These represent four general classes of compounds: (1) lignin compounds (Carbonox, Kembreak); (2) tannin compounds (quebracho, sodium palconate); (3) sugars and starches (pregelatinized starch); (4) cellulose (sodium carboxymethylcellulose). At least three of these classes of organic compounds have been either used in preparing commercial slow-setting oil-well cements or have been covered by patents for such use. However, their use in cements is in carefully controlled quantities.

The effect of the retarding type of treating chemicals was much more pronounced on the cement containing a chemical retarder than on those not chemically retarded. It appears that the effect of the retarding action of the treating chemicals and the retarder contained in the cement is additive, causing excessive retardation with only a small amount of contamination by these chemicals.

Tests made on the cements contaminated with drilling fluids containing the foregoing treating chemicals produced similar results, in most instances, to the results obtained when chemicals were added directly to cement slurry.

The most satisfactory means of combating the effect of these drilling-mud additives on oil well cement has been to reduce to a minimum the contamination of the cement with treated drilling fluids during a cementing job. This has been accomplished by the use of wiper plugs ahead of the cement in casings and by the use of buffer solutions or washes ahead of the cement or both. The wiper plug prevents any contact and resulting contamination between the drilling fluid and the cement slurry inside the casing, and a buffer wash helps eliminate contamination in the annular space between the outside of the casing and the formation. These buffer washes ahead of the cement have consisted of water, solutions of acid phosphates, calcium chloride, lime water, and other materials, as well as slurries of untreated bentonites and clays in water.

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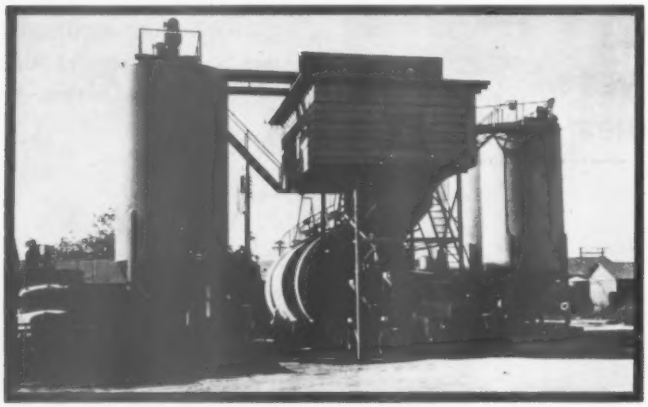

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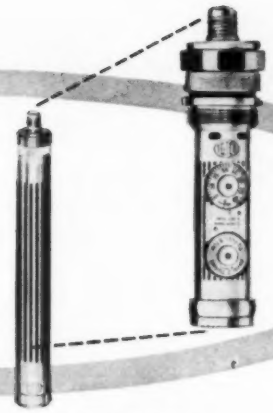

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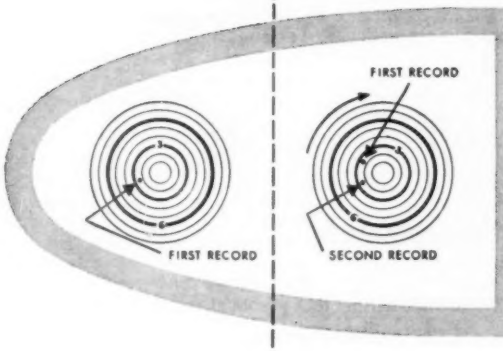

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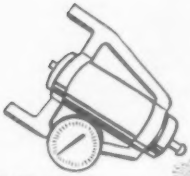

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Wood Fibers and Tree Bark Yield Effective Lost-Circulation Material

Wood is peculiarly suited for the manufacture of materials for combating lost circulation. Here's a list of some of these products and their uses.

by Thomas R. Frost* and R. A. Waldron*

THE idea of trees and forests providing raw materials for the manufacture of useful oil-well drilling products is not new. Quebracho extract is produced from the wood of the quebracho tree of South America. Tall-oil soaps, important emulsifiers for oil-emulsion muds, are byproducts of kraft pulping. Carboxymethylcellulose, of more recent use in drilling, is a wood-derived product as are the lignin products which have found special uses in drilling. This list of forest products serving the drilling industry, though it could be expanded, will suffice to show the very tangible connections between the industries.

The materials presently produced from the forests of the Northwest range from lost-circulation materials to quebracho-type materials. Some specific examples of these products and their method of use will be described in the sections that follow.

Lost Circulation Materials

Because of its fibrous nature, wood is ideally suited for the manufacture of materials for combating lost circulation. One of the lost-circulation materials produced in the Northwest is a scientifically designed, specially treated blend composed of wood fibers and flake-like particles—the latter being derived from tree bark. This combination was developed to make a product with a range of particle sizes and shapes particularly suited for combating losses of circulation in heavily fractured or vugular formations and has found wide application.

In addition to its excellent record of circulation recoveries, the material is convenient to handle. It breaks up and disperses in the mud readily and does not "rope" in mud pumps. Furthermore, greater concentrations of this lost-circulation material than most remain pumpable in muds. In common with other lost-circulation materials, it screens out on shale screens.

*Special Products Division, Weyerhaeuser Timber Co.

Unique Squeeze Technique

This lost-circulation product may be used as any other lost-circulation material. However, due to its special properties, a unique squeeze technique has been developed for use with this product. This thoroughly proven technique, originally developed for the Cody formation in the Rocky Mountain area, is utilized when ordinary usages of lost-circulation materials are inadequate to cope with extreme conditions of fracturing.

No special equipment is required for the squeeze, but certain adjustments of standard mud pumps must be made in order to control pressures and volumes and to avoid plugging. Both inlet valves on one side of the pump are removed, thereby rendering one piston ineffective. When the concentrations of the lost-circulation material exceed 45 lb. per bbl., some operators remove the valve springs although this is not an essential precaution due to the fact that the product does not "rope."

Almost any diameter drill pipe can be used regardless of concentration. Concentrations of 40-45 lb. per bbl. have been successfully pumped through 2⅞-in. drill pipe and 4¾-in. rock bits with no plugging. Higher concentrations (70-80 lb. per bbl.) can be pumped through open-ended 2⅞-in. drill pipe.

The sequence of operations in conducting this type of squeeze includes:

1. Mix a pit of 30 to 40 bbl. of mud containing about 40 lb. per bbl. of the lost-circulation fiber well dispersed.
2. Place the bit (or open-ended drill pipe) opposite or slightly above the suspected or calculated depth where losses occur. Pump in mud (usually 10 to 15 bbl.) very slowly making every attempt to fill the annulus. A rise in pump pressure of several hundred pounds indicates that the high-concentration mud has reached the bit. If the annulus is not filled by this procedure, add either mud or water via the fillup line. Should the annulus still remain unfilled, the fractured zone is above the bit, and the drill strings should be raised.
3. With the annulus filled, close the rams and squeeze about 5 bbl. of mud into the formation, exercising the caution that squeeze pressures do not exceed the known or estimated formation-breakdown pressures. The squeezes are repeated until a seal is effected which is indicated by the pressure holding to approximately two-thirds squeeze pressure.
4. When a seal has been effected, the pressure is released slowly by opening the rams. Normal drilling is then resumed.

Should several squeezes at 40 lb. per bbl. concentrations be ineffectual, the concentration is generally increased to 70 or 80 lb. per bbl. and more squeezes run through an open-ended drill string. Failure of the high-concentration squeezes indicates that cementing or other special procedures are required to seal the fractures.

Advantages of this type of squeeze are patent. It is effective. The pumpable high concentrations attainable with this lost-circulation fiber, the plasticity and felting properties of the fiber, and the selected range of particle sizes and shapes all help to insure a successful

TABLE 1—EFFECT OF DOUGLAS FIR BARK FLAKE FRACTION ON DRILLING-MUD FILTRATION PROPERTIES THROUGH A COARSE SAND

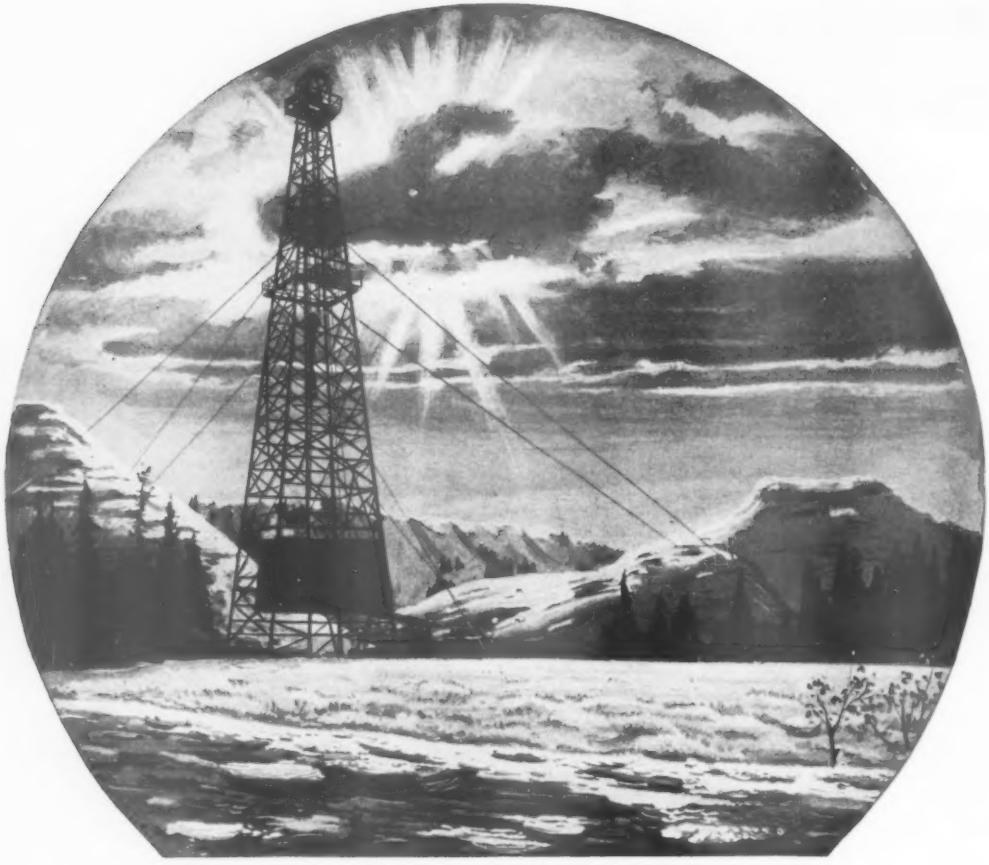
	Mud loss, cc. at				
Usage of bark flakes—	0 Pressure	30 Sec.	1 Min.	15 Min.	30 Min.
None	83.0	120.5	121.0	121.8	122.0
6 lb. per bbl.	14.8	15.2	15.5	15.6	15.7

Pressure—100 psi. Sand bed—2 cm. thick, —8 +14 mesh particle size. Drilling fluid—16¾ lb. per gal., oil emulsion, lime base drilling fluid from Iowa field near Lake Charles, La.

TABLE 2—EFFECT OF BARK FIBER FRACTION ON DRILLING MUD FILTRATION PROPERTIES THROUGH A MODERATELY COARSE SAND

	Mud loss, cc. at				
Usage of bark fiber—	0 Pressure	30 Sec.	1 Min.	15 Min.	30 Min.
None	7.5	25.5	26.0	28.5	30.0
5 lb. per bbl.	9.0	15.0	15.2	18.0	19.2

Pressure—100 psi. Sand bed—Del Ray sand, 2 cm. thick—permeability (to air), 120 darcies. Drilling fluid—111 lb. per cu. ft. hole mud from 4 State, Ocean City, Wash.



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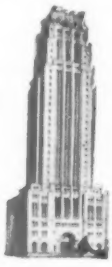

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squeeze with little or no danger of plugging pumps or bits. Sealing by this method is generally permanent, for the seal is effected within the formation. Thus, subsequent passage of tools over the zone will not unseat or disturb the seal. Another advantage of the method is its relatively low cost which derives from the fact that only a small fraction of the mud system is treated with fiber.

One of the lost-circulation materials made from the bark is composed of spongy, pliable flakes of various sizes. Possessed of remarkable plasticity and pliability in addition to a wide range of particle size, this product is used with good effect to seal fractured formations.

Another Douglas fir bark-derived lost-circulation product has an entirely different character from the flake-like material described above. This second product is composed of tough, short, rod-shaped fibers of varying lengths and diameters. Because of its unique fibrous character, this product combats lost-circulation problems that conventional lost-circulation materials fail to correct. The chief application of this product, and one in which it is highly effective, is in bridging porous thief formations where the loss of circulation, though appreciable, is quite slow. A decided advantage of this product is the fact that it passes shaker screens and is continually recycled in the mud stream.

Pecos County, Texas, Well

Such a use is illustrated by comparing the records of two wells drilled on a lease near Imperial in Pecos County, Texas. Three troublesome formations were encountered in drilling the wells on this lease. They were:

1. Yates sand, the least troublesome formation, contained pockets of relatively high-pressure gas which could be controlled by increasing mud weight with salt.

2. The San Andreas lime formation at about 2,700 ft. was the worst zone of lost-circulation, being capable of taking up large quantities of mud and lost circulation materials. In addition, this zone contained sulfurous water under relatively high pressure.

3. The final zone, the Clearfork lime encountered at about 3,200 ft., contained high-pressure gas which required mud weights between 11 and 12 lb. per gal. to control. However, when this mud weight was carried, extreme loss of circulation occurred in both the Clearfork and San Andreas zones. This, in turn, resulted in blowouts.

In drilling the discovery well, bad losses of circulation occurred in both the San Andreas and Clearfork formations resulting in several blowouts. After one blowout in the Clearfork, the pipe stuck, and much loss of time and extra expense resulted. Large quantities of conventional lost-circulation materials were used in efforts to regain circulation after this blowout without success until a combination of the bark-derived lost-circulation materials was added. An addition of 8 lb. per bbl. of this brought the well under control.

No trouble was encountered in drilling well No. 4 until the point of entering the San Andreas was reached. At this point, some loss of circulation was encountered but was easily controlled by the addition of five sacks of each of the bark products plus a few sacks of a conventional fibrous material.

Before drilling further into the San Andreas, the mud was converted to a saturated salt mud to bring the weight up. Several more sacks of the bark products were added and drilling progressed satisfactorily with only occasional loss of circulation. On these occasions, the addition of more bark products regained circulation quickly.

The well blew out on entering the Clearfork, sticking the drill pipe. A pit of saturated salt mud, weighted to 13 lb. per gal., was prepared and the bark products added to a total usage of about 10 lb. per bbl. Pumping in this mud brought the well under control. In subsequent operations to free the pipe (acidizing, washing with oil, etc.), the well blew out again freeing the pipe. Circulation and drilling were restored by pumping in a 12.5 lb. per gal. mud containing 4 to 5 lb. per bbl. of bark lost-circulation products.

During the 34 more days required to reach total depth, no further losses of circulation occurred, although during this time only 10-15 sacks more bark products were added and mud weights were maintained at 11.5 lb. per bbl. and higher.

A third well (No. 5) drilled in this same area without the use of bark-derived lost-circulation materials had to be cemented off in these zones when large quantities of fibrous and wool waste materials failed to regain circulation.

Mud-Conditioning Agents

Several of the commercial timber trees of the Northwest contain tannins and tannin-like compounds both in their wood and in their bark, bark generally being by far the richer source. Although the tannin from the bark of one species of tree will differ from the bark tannin of another species, all of the tannins fall into the class which includes quebracho. Furthermore, in some trees (such as Douglas fir) these compounds tend to be concentrated in anatomically distinct portions of the bark. On the basis of these facts, the bark is separated into its constituent physical parts and the fraction in which the tannins and related compounds are concentrated is used to supply the oil well drilling industry with a quebracho replacement or extender.

The tannin-rich bark fraction can be and is used as a direct replacement for quebracho in treating oil-well drilling muds. In such use, higher bark usages are required to reach treatments equivalent to nominal quebracho usages. However, this is not a disadvantage costwise because of the relatively low cost of the bark products. When thus used, bark requires only half as much caustic soda as quebracho in order to reach similar pH values.

This bark product performs in a manner similar to quebracho, controlling the rheological properties of mud and reducing water losses. Its property of water-loss reduction, however, is particularly notable. For the bark reduces water loss in two ways; first, in the characteristic manner of tannins, and second by physically blocking formation pores. Caustic soda does not completely dissolve the bark, as it does quebracho, and a fraction, composed of myriads of tiny fibers, remains undissolved. These fibers tend to prevent both water and whole mud from entering the formation pores.

Tables 3, A, B, C, and D illustrate the effectiveness of this bark mud conditioner in meeting a variety of situations calling for mud treatment.

Another application of this particular bark fraction is blending it with quebracho. Preferably, the blending is done when the quebracho is ground, but some drillers add the quebracho and bark simultaneously to the mud stream at the well. When mixed at the grinder, the bark in amounts up to 20 per cent of the quebracho is added just prior to grinding. This not only facilitates grinding but prevents subsequent caking of quebracho during storage.

TABLE 3 — TREATMENT OF VARIOUS MUDS WITH TANNIN-RICH DOUGLAS FIR BARK FRACTION

A. Alvin, Texas Shale-Water Mud

Mud properties—	Untreated mud	Mud treated with 1 lb. per bbl. Bark product	Mud treated with 1 lb. per bbl. Quebracho
30 min. water loss (cc.)	25.0	19.0	23.0
Stormer viscosity (cp.)	112	22	22

B. Louisiana Gulf Coast Mud

Mud properties—	Untreated mud	3½ lb./bbl. bark product treatment
30 min. water loss (cc.)	10.1	5.9
Stormer viscosity (cp.)	95	26
Gel—Initial (g.)	95	6
Gel—10 min. (g.)	120	43

C. Anhydrite Contaminated Rocky Mountain Mud

Mud properties—	Original mud	Contaminated mud	Contaminated mud with 6 lb./bbl. treatment
30 min. water loss (cc.)	17.0	29.0	16.4
Stormer viscosity (cp.)	13	37	19
Gel—initial (g.)	4	65	10
Gel—10 min. (g.)	34	100	25

(Continued on page 305)

Oldest in Westex?

This Dillard & Waltmire rig represents part of a nearly continuous drilling program on one lease since 1937. The lease is Gulf Oil Corp.'s Goldsmith, in Ector County, West Texas. The well this rig is standing over is numbered 719, and it has drilled to 5,800 ft. to the lower Holt lime pay. The drilling company is one of the oldest in West Texas, having first moved into the Hendricks area in 1927. The rigs were gone from 1929 to 1935 during the big East Texas campaign, but were then moved back. Dillard & Waltmire have five rigs in West Texas.

Oldest Tool Pusher?

The gentleman in the center is known to his many friends in South Texas as "Uncle Dick" Pauley, who is tool pusher for J. & C. Drilling Co., headquartered at Refugio. His associates whisper that Pauley has seen more years' service in drilling—to be actively participating in rotary-drilling operations today—than anyone else in this line of activity in the oil business. His coworkers say he's 72! At left is Claude B. Herring, field representative for Continental Supply Co., Corpus Christi, and at right is Clyde Harper, superintendent for Arnold O. Morgan Co.

Anchors Aweigh!

Much drilling is done in Coastal Texas and Louisiana by use of barge-mounted rotary rigs. This huge floating setup is owned by Penrod Drilling Co., and it is being towed to a new location up the intercoastal canal. Barge drilling is particularly active in the greater Corpus Christi bay region. Barges have been used to drill open water territory in the Gulf of Mexico also, but all drilling in the "tidelands" region has been suspended on Government order.

Quiet, Please!

These rigs of Gene Reid Drilling, Inc., Bakersfield, Calif., are completely shrouded with a plastic and glass-wool soundproofing envelope so that residents of nearby swank homes won't be disturbed. The wells above were drilled for Universal Consolidated Oil Co. at La Habra Heights, near Los Angeles. Because of the small size of the drilling island, the first two could not be put on pump until the rig was removed from location.

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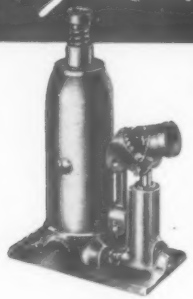
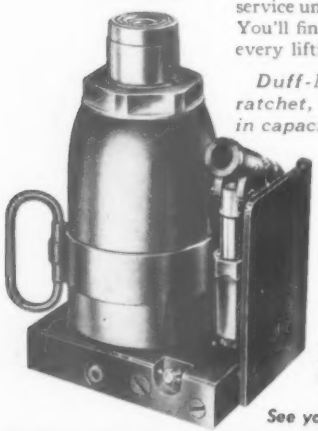


If smooth, fast, easy lifting and lowering are important to you . . . you will profit by standardizing on Duff-Norton Hy-Power Hydraulic Jacks. Capable of being used in both vertical and horizontal positions, these jacks have the all-around versatility you need. In the Duff-Norton Hy-Power line you'll find the correct sizes too: capacities from 3 to 50 tons . . . closed heights from 4½ to 11 inches . . . lifting heights from 2 to 7¾ inches.

These jacks are ruggedly built to give long service under the most severe working conditions. You'll find them real time and money savers on every lifting and lowering job.

Duff-Norton Jacks include hydraulic, ratchet, screw and air motor power models, in capacities ranging from 3 to 100 tons.



Write for Bulletin AD 16-U, which describes and illustrates Hy-Power Hydraulic Jacks.

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MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA.—CANADIAN PLANT, TORONTO 6, ONT.

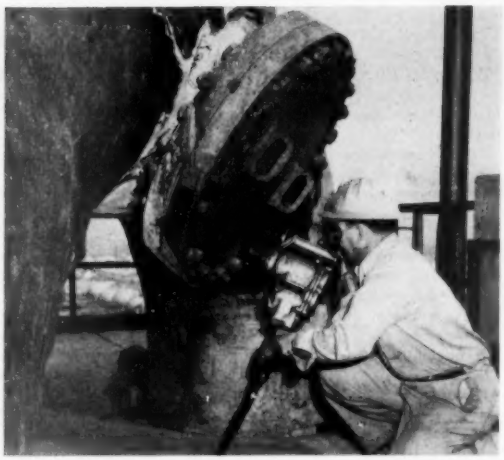
"The House that Jacks Built"

ANSWERS to "Do you Know Your Rotary Rigs?"

Proper designations for the 54 numbered items shown on the numbered drawing on page 167 are as follows:

Traveling Block	53
Suction Line	48
Stand Pipe	43
Rotary Table	38
Platform, Engine	33
Mud-Line Manifold	28
Line, Pump Discharge	23
Guard, Rotary Drive	18
Engines, Drilling	13
Derrick	8
Base Plate	3
Swivel Bail	52
Substructure, Ramp	47
Slush Pump	42
Rotary Hose Safety Chain	37
Mud-Tank Connections	32
Mud Gun, Movable	27
Line, Fillup	22
Guard, Drive Chain	17
Draw Works	12
Crown Block	7
Blowout Preventer	2
Swivel	51
Substructure, Draw Works	46
Shale Shaker	41
Rotary Hose	36
Mud-Return Line	31
Mud Gun, Fixed	26
Kelly	21
Goose Neck	16
Derrick Leg	11
Cross Tee	6
Air Chambers	1
Surge Chamber	50
Substructure, Derrick	45
Settling Pit	40
Rotary Hook	35
Mud-Return Ditch	30
Mouse Hole	25
Hydraulic Brake	20
Girt	15
Derrick Floor	10
Compound	5
Water Supply Line	54
Suction Tank	49
Steps	44
Runaround	39
Rathole	34
Mud-Mixing Hopper	29
Line, Rotary	24
Guard, Pump Drive	19
Gin Pole	14
Derrick Brace	9
Casing Head	4

Maintenance operations such as indicated here are carried out during scheduled shutdowns . . .



. . . but operations such as shown here may be completed while the unit is returning to operation.

On-Stream Maintenance . . . What and How?

In this type of maintenance, entirely different from general overhauling, much of the work can be fitted to the available manpower in planning the daily schedules

by J. O. Thoen* and Lloyd G. Foster†

IN a well-planned refinery-maintenance program, the character and scope of work during on-stream periods may differ materially from that done during turnarounds. In general, however, the form of organization, the system of planning, and the application of methods and standards are essentially the same. The difference lies largely in the conditions under which the work is done.

On turnarounds it is essential that the work be planned for the minimum down time. Adequate manpower must be assigned to get the work done within the specified time. Planning for efficient performance must be done without resorting to omissions, substitution, or postponement of any part of the work necessary as part of the turnaround.

In the case of on-stream maintenance, the time element applies to a lesser degree. Much of the work can be fitted to the available manpower in planning the daily schedules. This allows a certain amount of flexibility but also involves on the part of planning more long-range considerations.

*Chief maintenance engineer, and †senior industrial engineer, manufacturing department, Continental Oil Co. Presented at the Petroleum Mechanical Engineering Conference, American Society of Mechanical Engineers, September 22-24, Kansas City.

Type of Equipment and Work

The on-stream maintenance activities in connection with the unit proper should be concerned with, first, the repair work which can be completed after the unit is back on stream, and, second, preparatory work and prefabrication for the next turnaround.

In the first category will be found spare units such as pumps, drivers, and sometimes exchangers or coolers which can be repaired in place or removed to the shops for reconditioning and reinstalled while the unit is on stream.

Other equipment of the same type may not be indispensable at all times or may not be in continuous operation. These items and certain valves, lines, and instruments of the same status can be serviced on the on-stream basis. Still further removed from the basic functioning of the unit are such necessary maintenance items as paving, insulation, painting, structural work, lighting, and other utility systems.

The second category consists of the work of fabrication of and preparation for jobs which inspection indicates should be done during the next shutdown. This applies particularly to such items as are found to be subject to relatively uniform wear or corrosion, the progress of which can be plotted and extrapolated so that fairly accurate estimates can be made of the end point of safe usage. Typical examples are piping, furnace tubes, exchanger bundles and shells, pump rotor assemblies, and internals for towers and other processing vessels.

The aim should be, therefore, to limit as far as possible the work of the turnaround to installation of equipment which has been made ready in every respect during the on-stream interval.

In addition to the work required for the process units, the maintenance department has, of course, a sizable work load in maintenance of general plant equipment and facilities. This is a great variety of work which from the standpoint of planning and availability is of at least four general classifications.

1. Operating equipment which is in noncontinuous or only part of which is in continuous operation. This group includes treating, blending, packaging, and loading plants and certain utilities.

2. Continuously operating equipment which can either be partly or completely shut down temporarily whenever men are available. The more important of these are the general utilities such as the plant air, cooling water, and power distributing systems.

3. Equipment which is generally available at any time. This includes buildings, grounds, sewers, shop equip-

ment, and all the mobile equipment.

4. Considerable work which is not properly classed as repairs still is part of the maintenance program, including cleaning of operating equipment and loading and unloading of supplies and materials.

The maintenance department is also called upon to do construction work whenever the size and scope of a project of this classification do not warrant setting up a separate organization with independent supervision and control.

Since all these varied activities constitute the general on-stream maintenance program, any system for effective performance must take them all into account.

Cost Control

The maintenance department's primary task is to see that the work is done when needed, but it also has as a major responsibility the function of cost reduction in its field. For this objective the variety of measures to be taken can be classed broadly under two heads. One is a program of preventive maintenance which seeks to reduce the frequency as well as the extent of the jobs. The other program would have as its objective the maximum efficiency and economy in the performance of the work.

Preventive Maintenance

Preventive maintenance requires the attention and efforts of practically all line and staff groups in the refinery. Its control must, therefore, be a function of the refinery management itself. All the possibilities of preventive maintenance are rarely completely explored. This seems to be because so many phases of and opportunities for preventive maintenance are not recognized as such.

If the need for proper coordination is appreciated, a fairly definite plan with specific procedures can be formulated. Such a plan if carefully followed through could be regarded as a starting point for the development of every phase of improvement possible in the maintenance program.

Begins with design . . . It can be safely said that preventive maintenance begins on the drawing board where the plants are designed. The selection of materials, the design of equipment, its location and spacing, provision of working platforms or other means of access, and use of instruments whenever they can be helpful in disclosing and interpreting faulty conditions are some of the things the designer should consider from a preventive-maintenance angle.

Another important feature is the installation of spares where they will serve not only as insurance against shutdowns but to allow periodic inspections at the proper time to avoid major repairs.

The next activity in the order of sequence is the care taken of equipment by the operators. High maintenance costs can be prevented by avoiding over and underloading and fluctuations in control, especially temperature conditions; by careful lubrication and servicing; and by alertness to signs of trouble. The latter may require the use of most of the senses but particularly sight and hearing, unaided or with the help of the instruments mentioned above.

That part of the preventive maintenance program which is most productive of results is also that involving the most work. This is the system of periodic inspections, an important part of which is the keeping and analyzing of records of the inspections and repair of equipment. Such a system requires considerable study. The different types of machines and equipment will vary greatly in the optimum length of intervals between inspections.

The aim is to prepare a definite schedule for all equipment, a schedule from which nothing can be omitted without risking high maintenance costs. At the same time the scope of such inspections as well as their frequency should be held to a minimum in order to reduce loss of operating time and ineffective labor to the minimum. This effort becomes a continuous process. Constantly, if good records are kept, there will be reason to add and delete items, changing the interval or changing the scope of the inspections.

One part of the inspection program is the daily work of observation and adjustment on the part of mechanics who are skilled in the knowledge of the particular machinery or equipment they are assigned to watch. They may tighten packing and check lubrication, motor temperatures and pump speeds, voltages, pressures, and surrounding conditions which may be harmful to the equipment.

These men, like the operators, should be alert to any unusual condition and should correct it or call it to the attention of the supervisors. In this respect there is some common responsibility on the part of the operator and the mechanic, and close collaboration between them is essential.

The technical staff, particularly the corrosion engineers, has an important place in preventive maintenance. Since a large proportion of maintenance involves the problem of loss or failure of metal, the continual application of corrosion and metallurgical engineering studies is indispensable.

It should be assumed that there is a possible preventive measure for every case of corrosion, erosion, abrasion, and fracture. By studying the facts involved and analyzing the cause of the failure, the technologist by application of his specialized knowledge can often indicate the remedy. He thus becomes a direct aid to the designing engineers as well as the maintenance department.

Other staff groups, such as process engineering, laboratory, and research, can often contribute materially to the preventive-maintenance program. The possibilities are so wide and varied that it cannot be said that any list of activities comprises all that such a program requires. In the end, however, someone must study all the records and reports of costs and performance from the broad standpoint of seeing what has been done in the past and how such information can be used for future improvement.

Again it is desirable to have a minimum number of reports and only such detailed information as is of value. Completeness is in itself a necessary element in any record or report; but the system should be so designed that outstanding items, good or bad, can be plucked from the whole for the attention of the supervisors or staff member responsible for their control. Unless a satisfactory control system of this kind is already in effect, it should devolve upon the industrial engineering staff to develop it.

It is not inappropriate for the industrial engineering staff to continue the function of the analysis of cost and performance records with a view to finding the items requiring attention. It is often possible, however, to convert this function into a more or less routine procedure which can be handled satisfactorily by someone in the maintenance-department office.

All these preventive-maintenance activities will ultimately lead to the development of standards. While many standards may be completely arbitrary and yet incorporate all the advantages of standardization such as the adoption of one screw or nail size and shape instead of having several of almost identical proportions, most standards needed in a refinery are those which are developed from experience.

The constant aim of the maintenance organization should be to try to find a standard for everything. Every effort made in this direction will result in continuing improvement in every phase of the maintenance program.

Job Performance

In getting a maintenance job done correctly and economically, much more than technical know-how is needed. Again the activities of several groups may have to be coordinated. Careful

(Continued on page 305)

An Announcement of Importance!

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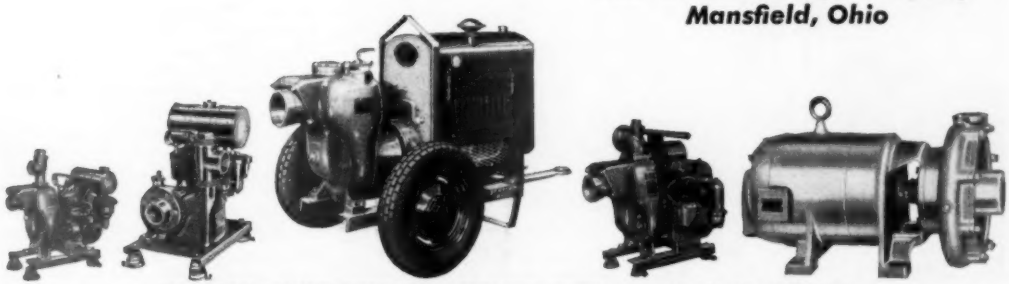

SELF-PRIMING CENTRIFUGAL PUMPS FOR HIGHER EFFICIENCY ON-THE-JOB

AERIAL VIEW of Sterlington, La., petrochemical plant of Commercial Solvents Corp.

PETROCHEM REPORT:

Commercial Solvents Corp., Sterlington, La.

Plant's production of ammonia and methanol will be doubled by expansion program

by F. Lawrence Resen
Gulf Coast District Editor

A $21,000,000 PLANT expansion program highlights activities of Commercial Solvents Corp. at its Sterlington, La., petrochemical plant.

The new facilities will double the present capacity for the production of ammonia and methanol. Also included is a new plant for the production of solid ammonium nitrate. Cost breakdown shows ammonia-methanol expansion of $16,450,000 and nitrate-plant expenditures of $4,087,000.

Products at the plant, in addition to the foregoing, include methanol-type antifreeze and nitrogen solutions for agricultural purposes. In the various processes, natural gas is used as the prime raw material, with nitrogen obtained from the air as a second important raw material.

Methanol . . . In the production of methyl alcohol, the natural gas figures as the essential source of the product, for steam is used to break methane down to carbon monoxide and hydrogen and the two components are then reacted to produce methanol. In the process carbon dioxide is also formed and reacted with hydrogen to produce methanol and water.

$$CH_4 + H_2O \rightarrow 3H_2 + CO$$

$$CH_4 + 2H_2O \rightarrow 4H_2 + CO_2$$

$$CO + 2H_2 \rightarrow CH_3OH$$

$$CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$$

Although the latter method results in a diluted product and also consumes additional hydrogen, it is favored at Sterlington because of the more positive control of the synthesis reaction. A second point considered is the highly exothermic reaction using the monoxide, which is roughly twice as intense as that when the dioxide is used. "Hot spots" resulting within the converter section of the process flow are able to reconvert the gas to methane, which is even more exothermic, and the cycle which may thus be started is difficult to control.

In following the dioxide step, however, it is necessary to provide excess carbon dioxide. This is obtained from

COMPRESSION FACILITIES are housed in this building at the Sterlington plant. Processing units are in the background.

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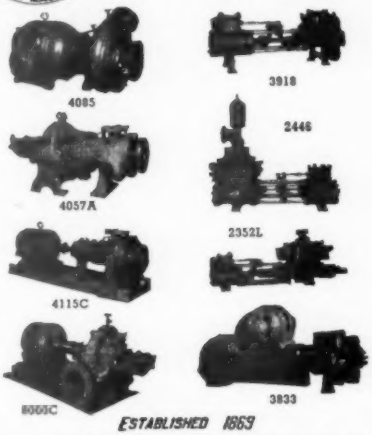

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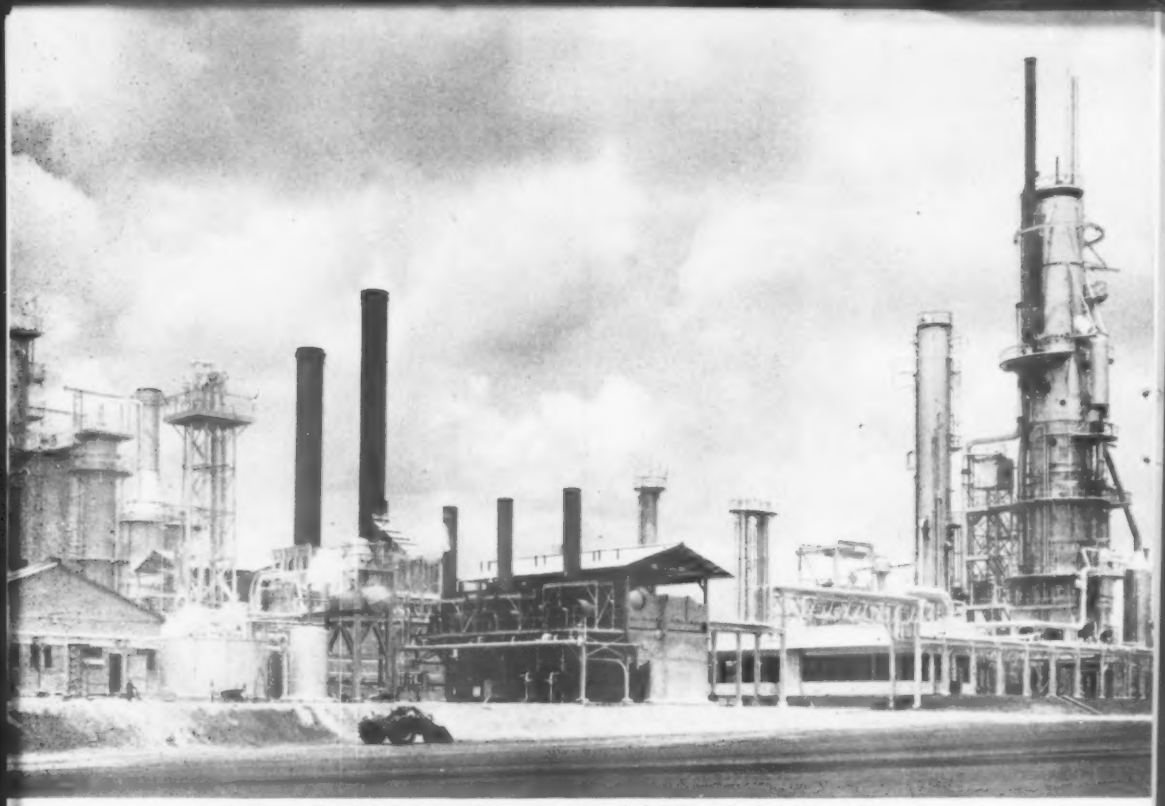
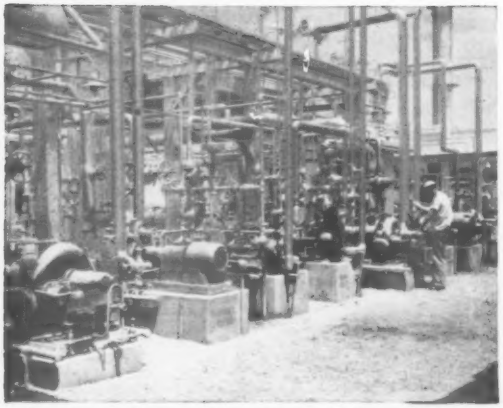
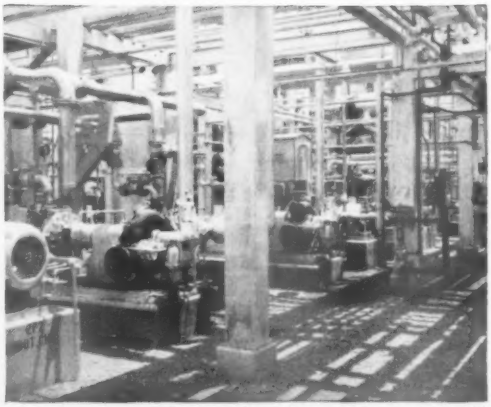


McMurrey Refining Company, Tyler, Texas, installed G-E mechanical-drive turbines throughout their plant to help assure continuous capacity output of 5000 bbls. per day.

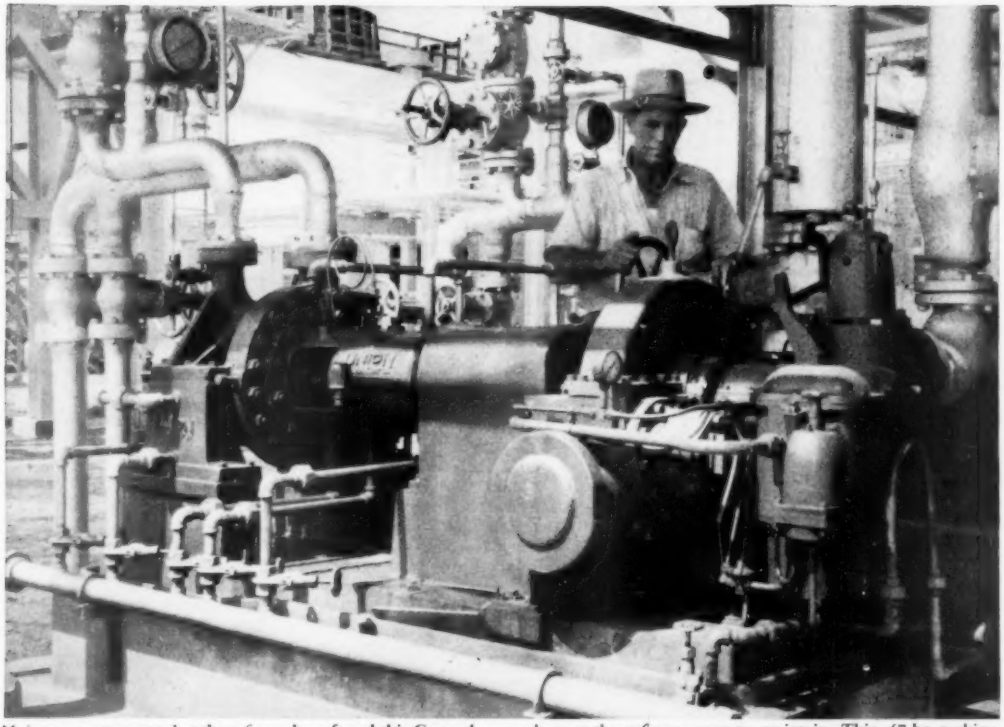
G-E Turbines Save Maintenance,



G-E turbines and motors are paired at McMurrey Refinery to utilize large steam supply efficiently. When process steam demands decrease, surplus steam is economically diverted to turbine drives. These Type DP turbines range from 8 hp to 41 hp.



Shown here is part of a row of ten General Electric Type DP turbine drives and motors, ranging from 9 hp to 48 hp. The many interchangeable parts on these turbines make stocking of spare parts an economical matter.



Maintenance personnel at the refinery have found this General Electric Type DP mechanical-drive turbine, like the many others at the refinery, easy to maintain. This 47-hp turbine at McMurrey Refinery drives a boiler-feed water pump.

Inventory Costs at McMurrey Refinery

Installed to improve steam balance, G-E standard turbines, with many interchangeable parts, also cut inventory costs.

The McMurrey Refinery, Tyler, Texas installed General Electric mechanical-drive turbines to help regulate steam balance. Since process steam demands range from 30% to 70% of available supply, surplus steam is economically diverted to turbine drives.

Time soon proved the many other advantages of G-E turbine drives which were especially designed for the petroleum industry. Mr. Dave Hood, Mechanical Maintenance Foreman at the refinery, states, "With these turbines on the line now for over a year, we're happy to report that they are extremely easy and economical to maintain, requiring very little of our time for maintenance."

Mr. Hood also said, "Since we have quite a few different sizes and ratings of turbines here, we're particularly pleased with the great number of interchangeable parts on these turbines. It certainly cuts down our inventory problem." Interchangeability of a great majority of the replaceable parts (regardless of hp rating) is a big feature with G-E standard turbine drives, which are paired with motors throughout the refinery to help assure uninterrupted service.

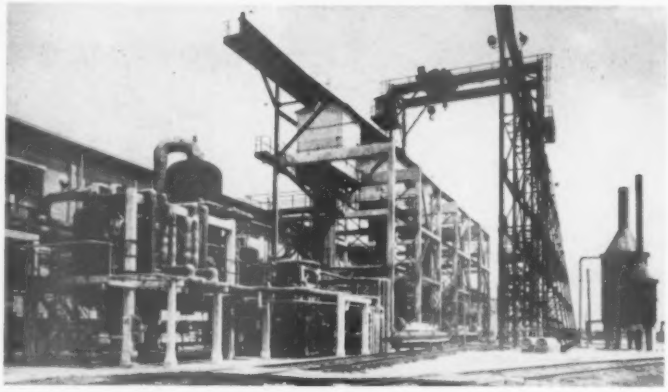
Call in your G-E sales-engineer or write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." Section 252-58, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

the waste gas from the ammonia unit and injected into the gas cooler.

In the synthesis of methanol the equilibrium constant is small and decreases rapidly with temperature rise. As a result, the practical operating limits of the process are limited to a temperature range of 300°-400° C. Below this range reactions are too slow and above it the equilibrium constant becomes too unfavorable.

To assist in the conversion, pressure is applied to shift the reaction in the direction of higher conversion. C.S.C. uses a temperature of approximately 400° C. and a pressure of 4,800 psig. in its conversion step. However, due to the limited allowable temperature range, flow is carefully arranged to allow for close control of temperatures throughout the synthesis.



PROCESSING FACILITIES at Commercial Solvents plant include equipment for production of methanol, ammonia, and ammonium nitrate.

Process flow . . . Natural gas, consisting of primarily methane, is obtained from gas fields in the Monroe, La., area. The process gas then flows through a gas preheater and passes through sulfur-removal drums before entering the reformer furnace. The drums contain zinc oxide pellets which react with hydrogen sulfide to form zinc sulfide and water.

The purified gas is joined by an incoming stream of steam at 30 psig. and 940° F. This combined stream then passes through the reformer furnace where the breakdown of the methane into the reformed gas takes place. The reformer furnace consists of a bank of catalyst-filled tubes arranged in six sections. These 132 tubes are filled with ceramic cubes impregnated with finely divided metallic nickel.

The reformed gas passes through heat exchangers and then into a final gas cooler. The cooler is a bubble-cap tower divided into two sections which operate in parallel. Water is passed through the tops of both of the sections and cools the gas prior to its entering the gas holder, which stores process gas for conversion.

The gas passes into three parallel compressors where five stages are used to raise the pressure to 4,500 psi. The gas then passes into circulators which boost the process gas to the operating pressure of 4,800 psi. Following the circulators are oil traps where last traces of contaminants are removed before the gas enters the converters.

Conversion . . . Main feed to the converter flows downward through the top of the converter through the shell of the converter and serves to cool the catalyst bed. The gas flow then passes upwards through tubes and then downwards again through the catalyst beds before passing from the bottom of the converter to the methanol separator.

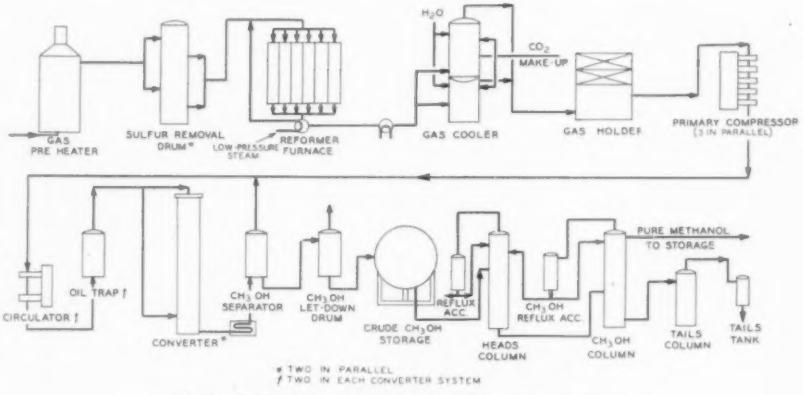
In addition to the main gas line into the converter, a bypass line is provided to the bottom of the unit as well as quench lines located at various points so that cold gas may be injected to closely control operating temperatures. The temperature may also be controlled by varying the flow of gas.

An aftercooler is used with the converter to condense the methanol. Effluent from the cooler passes through a separator where the gases are taken off and returned for recycling. Crude methanol is then passed through a let-down drum and on to storage. Purification of the crude product is effected in a series of distillation columns.

Background . . . Commercial Solvents was one of the first companies to produce methanol in the United States using natural gas as a raw material. This process has largely supplanted that using coal as the raw material. The original plant was located at Peoria, Ill., but was shut down when the present facilities were placed on stream.

The Dixie Ordnance Plant was built and operated for the Government by Commercial Solvents in 1942. Four years later the company acquired the plant from the United States and in 1948 completed the methanol plant including a packaging plant for antifreeze products. A nitrogen solutions plant was completed in 1951 and present expansion is expected to be completed in 1953. Total investment will exceed $32,000,000 at that time.

Plant personnel at Sterlington include: J. E. Wheeler, manager, Dixie division; O. H. Manhart, plant superintendent; J. E. Sanchez, plant engineer; R. T. Lukat, plant chemist.



FLOW DIAGRAM for Commercial Solvents methanol process.

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Wood Fibers

(Continued from page 291)

D. Cement-Cut Bentonite Mud

Mud properties—	Before treatment	After 4 lb./bbl. treatment
30 min. water loss (cc.)	15.0	10.2
Stormer viscosity (cp.)	(*)	26
Gel—Initial (g.)	(*)	8
Gel—10 min. (g.)	(*)	45

(*) Mud too flocculated to measure.

Still another product useful to the drilling industry is obtained from Douglas fir bark. Physically, this bark fraction is composed of very small particles most of which would appear as tiny fibers under suitable magnification. Chemically, the outstanding features are a high content of low molecular weight lignins and the presence of some tannin substance.

These characteristics, both chemical and physical, suit this bark product for use in completion fluids—particularly oil emulsion muds. Its function in this application is also twofold. By virtue of its physical properties it is a spurt (the tendency of whole mud to "spurt" into formation capillaries under pressure) reducer, and by virtue of its chemical properties it is an aid to emulsification.

As to spurt-reducing properties, the tiny fibers present in the product reduce fluid loss, thereby tending to prevent water blocking of oil-bearing capillaries. These same tiny fibers do their bridging of pore openings in such a fashion as to prevent migration of clay particles into the pore spaces, but not in such a way as to appreciably hinder the oil flow back into the well shaft. In fact, their blocking action is consummated on formation wall surfaces, and thus they are easily removed by the back pressure of the oil. The net effect is the conservation of the original pay zone formation permeability. This, of course, results in higher ultimate production, and in some instances means a flowing instead of a pumping well.

Wells have been drilled where mixtures of 20 per cent crude oil and water-base mud have been satisfactorily treated with Douglas fir bark. The use of bark necessitates reduced amounts of other emulsifiers, if required, while the special advantage of mud spurt reduction is gained as well.

TABLE 4
Return Permeability of a 20 Per Cent Oil Emulsion Mud Treated With 5 Lb. per Bbl. Douglas Fir Bark Mud Spurt Reducer

Deplastering pressure (mm. mercury)—	Per cent of original permeability regained: Untreated sample	Treated sample
55	6.2	7.9
120	16.6	30.2
220	23.3	32.5
100 psi. oil flush		
55	23.5	43.0

Deplastering oil—4 cp. mineral oil—xylene mixture.

Glossary of Mud Products (Weyerhaeuser)

Silvacel fiber—blend of specially prepared wood fibers and spongy flakes from Douglas fir bark—lost-circulation material.

Silvaflake—spongy flakes from Douglas fir bark—lost-circulation material.

Superbridge—short rod-like fibers of various lengths and diameters obtained from Douglas fir bark, available in both coarse and fine grades—lost-circulation material.

Silvatan—fine powder containing 25-30 per cent cellulosic fibers and 70-75 per cent tannin and chemically related compounds soluble in strong caustic solution—for conditioning water-base mud; improving rheological and water-loss properties.

Silvacon 100—fine powder from Douglas fir bark containing some tiny fibers and a high content of low-molecular-weight lignins and tannins, approximately 15 to 20 per cent water soluble—for addition to completion fluids for conserving formation permeability and assisting in emulsification.

On-Stream Maintenance

(Continued from page 296)

planning must be done to the end that a large number of jobs can be carried on simultaneously and each job properly executed. The various steps to be taken and the problem that each involves will vary with the nature and size of the job but usually include the following:

1. Defining and describing the job.
2. Engineering (design planning).
3. Manpower planning.
4. Scheduling.
5. Providing tools and facilities.
6. Preparing the equipment.
7. Selecting and assigning the men.
8. Supervising.
9. Following through.

In the case of relatively small repetitive maintenance jobs, most of the above steps involve no problems; but all of the steps must have been taken at some time or the job cannot be done. In the case of larger jobs involving several crafts, many of the steps become real problems. If these problems are not thoroughly explored and a solution reached which is satisfactory to the persons responsible for carrying out the work, the job will not be done efficiently if it is done at all.

Specialization . . . It is obvious in looking over these steps that the skills and responsibilities involved differ widely. In a very small plant one man may do all of them; but as the work increases in scope, specialization is found necessary. Too frequently the value of specialization is overlooked, or at least minimized. There is, in particular, a tremendous inertia in the thinking with respect to the functions and responsibilities of a supervisor. It is assumed that he, being a maintenance man, should know more about how to engineer, plan, and schedule a job than anyone else.

Each of these are staff functions closely tied to the following step, but each requires an entirely different training in technique and procedure, and all differ from that required for the function of supervision.

To illustrate further, supervision, which is shown as a single function, is itself subject to specialization. When a maintenance job is being performed, there is needed a supervisor on the job to coordinate the various crafts and see that they perform their tasks. This is job supervision. At the same time, the members of each craft are subject to supervision by the craft leader who is responsible for their training in technique as craftsmen and in their duties and responsibilities as employes. He is responsible for the **how** part and the job supervisor for the **what** part of the plan.

A plan is but a guide. It takes management on the part of someone to make it work. Frequently great difficulties are encountered in trying to see that the plan is followed. This makes it appear that a plan may be good but supervision or execution faulty. This is not necessarily so; perhaps the planning simply did not go far enough. The difficulties involved in some of the steps were not foreseen. The variety of such problems and difficulties warrants detailed study and analysis, and here again is a typical field for the application of industrial engineering.

Studies applied exclusively and continuously to the progress of the job will reveal the weaknesses in planning, and in most cases the logical solution will be apparent. The solution, the nature of which may be perfectly clear, may itself present serious difficulties. For example, if it is of an organizational nature, there may be involved obstacles in the way of major policy, tradition, training problems, etc. Technical problems are often much easier to solve.

More men may be assigned to every function than are needed for that purpose. This may actually be desirable in getting the system started, and the studies will then take the following order:

1. Determine how many men are actually being used for each element of the work and schedule accordingly.

2. Eliminate from the schedule the excess manpower, making the men available for other work.

3. Improve methods to reduce further the man-hour requirements.

The last stage of methods improvement is that in which the various standards which are needed begin to take form. In their final development, they are the results of the collaborated effort of the craftsmen, the operators, the supervisors, the industrial engineers, the designing engineers, and management. Experience in many industries shows that such standards can cover more than 85 per cent of the maintenance work. In any plant it is then and only then that we can hope to have the work proceed with the maximum smoothness and economy.

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THE JOURNAL'S WEEKLY
Engineering Reference
SECTION

No. 24

FANS AND BLOWERS:

Part 5—Specifying Fans or Blowers

by M. Van Winkle*

MOST manufacturers supply rating tables for the particular type of fan or blower which they manufacture.

Centrifugal or radial-type fans . . . A table is supplied for a fan of given wheel diameter and outlet area. Outlet velocity in feet per minute and capacity in cubic feet per minute are correlated with a number of outlet static pressures given in inches of water and for each outlet pressure and each capacity, both r.p.m. and horsepower, are given. These figures are based upon the standard air density of 0.075 lb. per cubic foot.

Axial fans . . . Rating tables are usually for constant fan speed in r.p.m. In these tables fan diameter is correlated with outlet pressure in inches of water and capacity in cubic feet per minute. Horsepower requirements are given for each fan diameter at each outlet pressure.

Fan rating tables enable the purchaser to select a fan having the required characteristics which fulfill his specifications for a particular application. When the purchaser's specifications fall intermediate to the values given in the tables, it is possible to interpolate between the values given in order to arrive at the size and speed of fan for the job.

Specifying a fan or blower . . . In order to arrive at suitable fan and blower specifications, evaluation of the following items should be made:

1. Quantity of gas in cubic feet per minute.
2. Density and temperature of the gas.
3. Inlet pressure.
4. Outlet pressure desired.
5. Corrosiveness and abrasiveness of the gas to be handled.
6. Type of fan desired.
7. Type of blade or sheave.
8. Space to be occupied by the fan and driving mechanism.
9. Fan arrangement.
10. Type of driving mechanism.
11. Type of control mechanism.
12. Noise characteristics.

After a careful study of all of these factors, the specifications can be drawn up for the fan or blower. The specifications which are given to the manufacturer or which are used as the basis for discussion with the manufacturer should include the following things:

1. Type of fan or blower desired.
2. Materials of construction.
3. Capacity range at high efficiency.
4. Pressure at specified capacity.
5. Type of capacity control.
6. Type of driver and arrangement.
7. Rotation and discharge designations.
8. Inlet box designations.
9. Motor position.

It is always advisable to ask the manufacturer to check the selection and specifications based upon the data which were used for setting up the specifications.

Notes on installation . . . Improper installation of a fan or blower setup can result in a number of difficulties with respect to performance of the fan or blower and in its maintenance and operation. A few of the points which should be considered are given as follows:

1. The inlet and outlet ducts should always offer smooth flow paths to the gas. Sharp angles and turns introduce eddy losses, decrease efficiency of the system, and increase horsepower requirements for the same capacity output.

2. Inlet and outlet ducts should never introduce sharply contracted or expanded paths for the gas. This causes expansion-contraction energy losses, decreases efficiency, and increases power output for the same output capacity.

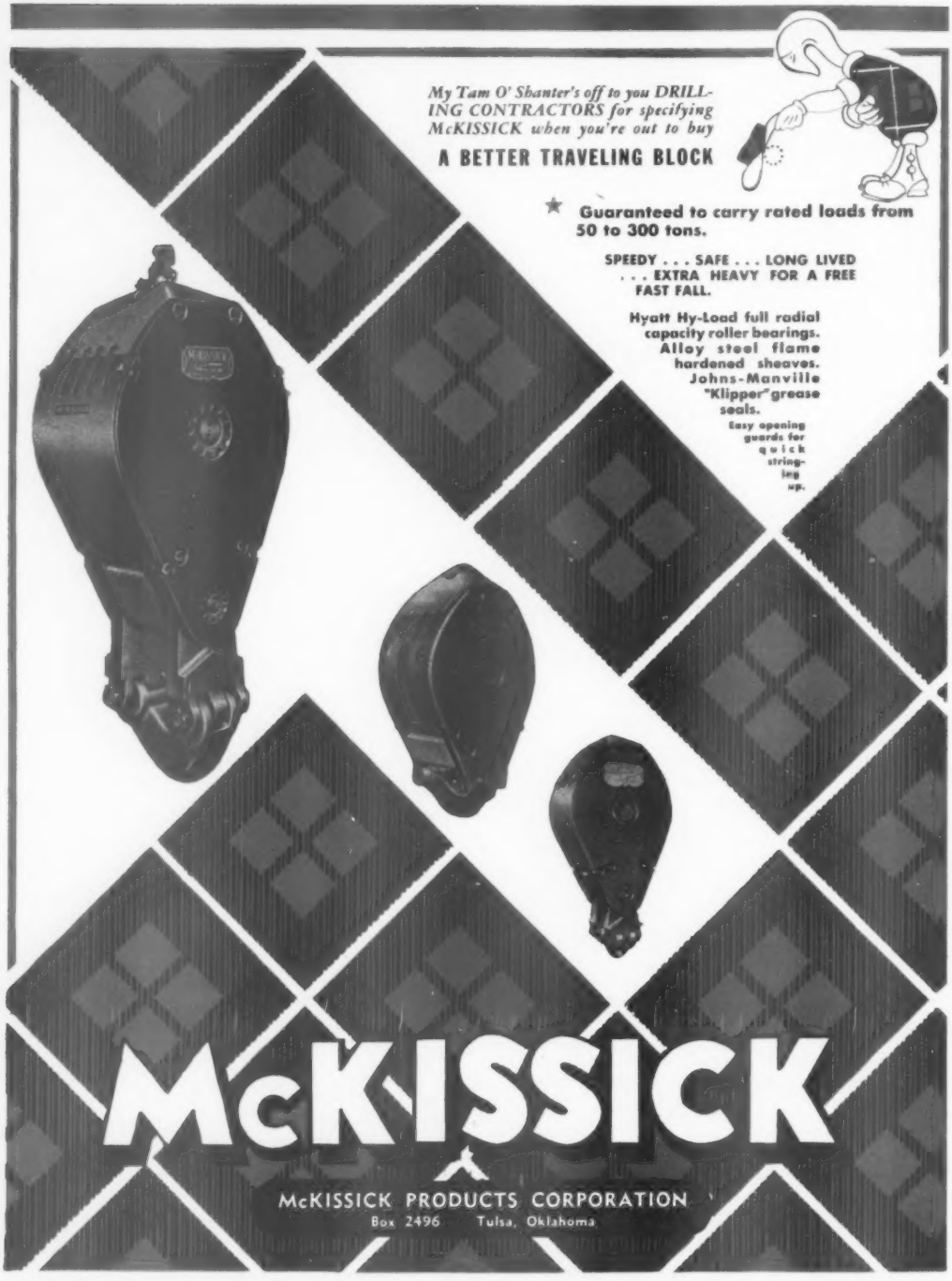
3. The fan or blower setup should be made in such a location that it is easily accessible for lubrication and maintenance.

4. Fan or blower and driving mechanism should be mounted solidly on foundations or supports which will reduce vibration to a minimum. This vibration will cause wear to the fan equipment and surrounding equipment.

Movement of Gases—Fluid Dynamics

The power requirements of a fan or blower are those required to move a **weight** or **mass** of gas or vapor from one place to another, to overcome frictional resistance of this quantity of the material passing through ducts and conduits, and to overcome mechanical frictional resistances in the fan itself. While the quantity delivery by a fan or blower is commonly given in terms of volume, it must be remembered that it is the movement of the **weight** or **mass** of material that uses power, and not the volume. In other words, twice the volume of a gas of one-half the density could be delivered by a fan requiring a certain horsepower, operating at a certain speed, and delivering at a fixed pressure.

*Professor of Chemical Engineering, University of Texas.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QUESTIONS ON TECHNOLOGY

by W. L. Nelson
Technical Editor

High-Sulfur Crude Oils—Potential Hydrogen Sulfide Liberation

"If 'sour' crude oils are those that contain dissolved hydrogen sulfide as in your issue of August 4, 1952, how do you define 'high sulfur' crude oils?"—S.M.T.

It is not the purpose of this department to make definitions. Its purpose is to explain such usages as exist, and if classification or differentiation is difficult or not clear, to indicate those differences that seem to be significant.

The meaning of the term sour with respect to crude oils or distillate stocks is clearly indicated by usage in the petroleum industry to mean that sour crude oils contain dissolved hydrogen sulfide (see Questions on Technology, July 28, 1952, and August 4, 1952). Other sweet crude oils that are substantially free from hydrogen sulfide may contain large amounts of total sulfur. Upon heating to about 400° F. or higher, the high-sulfur crude oils tend to decompose yielding hydrogen sulfide and other low-boiling sulfur compounds just as large hydrocarbon molecules crack or decompose into lighter ones. Thus, high-sulfur crude oils are potentially able to generate hydrogen sulfide and the sulfide so produced might be called "potential hydrogen sulfide." Crude oils or oil stocks vary greatly in their tendency to generate hydrogen sulfide. Table 1 indicates the percentage of sulfur in cracked gasolines as a function of the amount of sulfur in cracking-plant feed stocks.

Although all of the sulfur in the crude oil or various oil charge stocks, except the dissolved hydrogen sulfide, might be considered as "potential sulfide," in a practical way refiners are most interested in the hydrogen sulfide (and mercaptan) formation during processing. Standard methods of determining the potential liberation of hydrogen sulfide have not been formally adopted because the amount of liberation depends upon the process that is being conducted. With respect to the absorption oil that is used in natural-gasoline plants, etc., one company employs a test in which the oil is heated for 45 minutes at a temperature of 500° F. Any liberation of hydrogen sulfide, measured by the action of the gas on lead acetate paper or on a copper strip, is reason for rejection.

In testing crude oils, the method of Davis, Jones, and Neilson *(The Oil and Gas Journal, May 26, 1948)* may be used. It consists of a steam distillation to 650° F., and the liberation of hydrochloric acid as well as hydrogen sulfide. Although this test is more severe than the "absorption oil" test described above, even more severe tests might be useful in testing cracking stocks.

Another and perhaps more widely used method of classifying oils as high-sulfur oils, is an examination of the sulfur content of the straight-run products. If the gasoline (straightrun and cracked) is to contain less than 0.1 per cent sulfur, the kerosine less than 0.13 per cent sulfur, and the diesel fuel oil less than 0.5 per cent (sometimes 1 per cent is satisfactory), the parent crude oil should not contain more than about 0.5 per cent sulfur. Straight-run gasolines usually contain relatively small amounts of sulfur, and this is helpful in permitting refiners to meet the 0.1 per cent requirement by blending cracked and straightrun gasolines. Examination of Table 2 shows that most 0.5 per cent sulfur crude oils from almost all areas will produce products that meet the sulfur requirements enumerated above. This probably accounts for the general usage in the Mid-Continent area of the United States where 0.5 per cent crude oils are often classified as being high-sulfur oils.

In certain areas, notably California, Montana, the Middle East, etc., where the sulfur content of the crude oils is relatively high, there is a tendency to consider crude oils that contain over 1.0 per cent sulfur, as high-sulfur crude oils.

TABLE 1
Percentage Sulfur in Cracked Gasolines as a Function of the Amount of Sulfur in the Feed Stocks

Source of cracking stock—	Multiply percentage of sulfur in the charge stock by these factors	
	Thermal*	Catalytic†‡
California	0.34	0.30
Wyoming	0.16	0.18
West Texas	0.18	0.12
Venezuela	0.13	0.11
Middle East (or Arabian)	0.08	0.13
Mexican	0.10	...
Mid-Continent	...	0.03-0.10

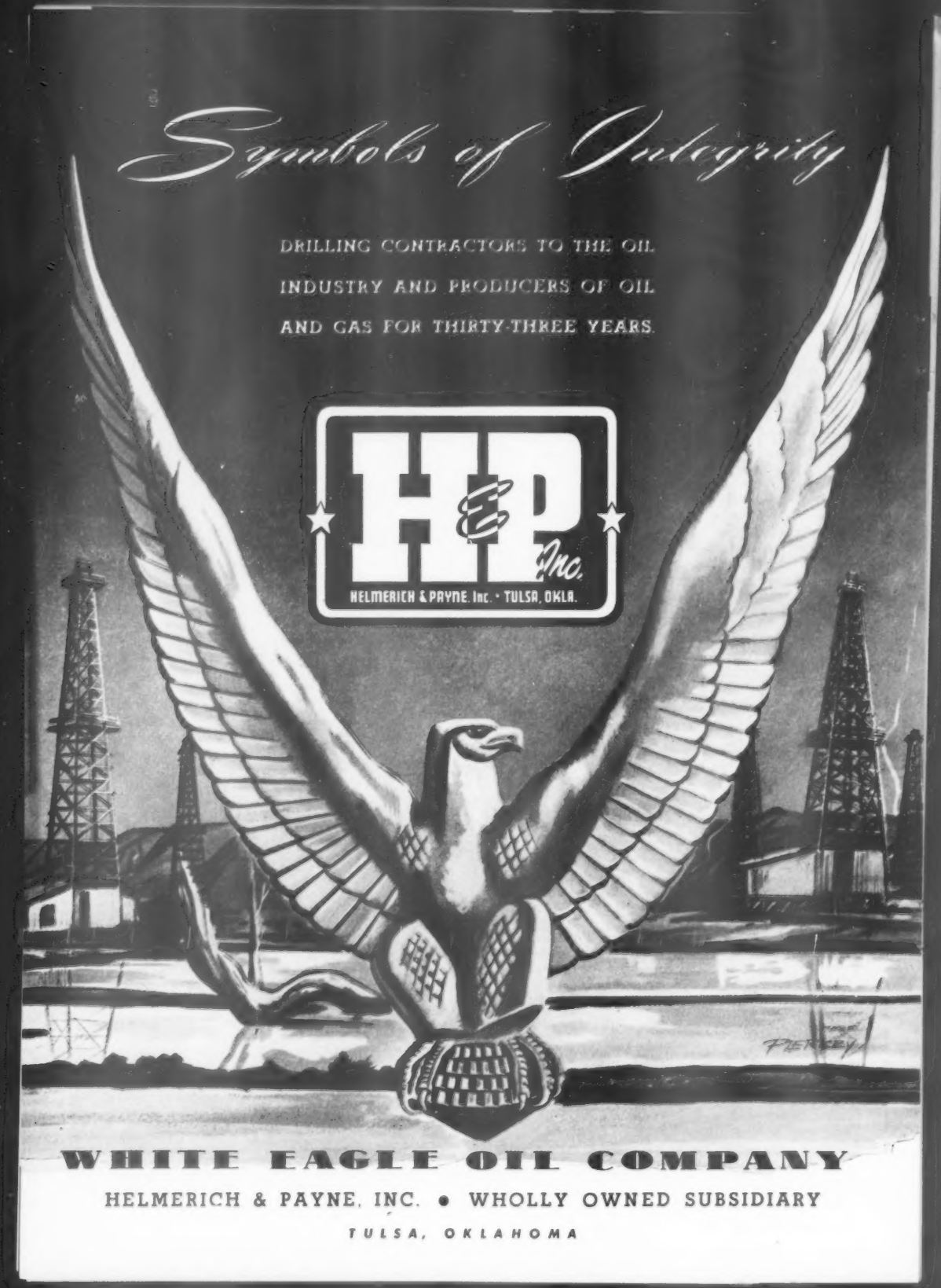
*Barron et al, Ind. Eng. Chem., Dec. 1949, p. 2687. †Sterba, M. J., Ind. Eng. Chem., Dec. 1949, p. 2680. ‡Fowle and Bent, The Oil and Gas Journal, 46, No. 27, p. 209, 1947.

TABLE 2—SULFUR CONTENT OF PRODUCTS (APPROXIMATE)

Sulfur content of crude oil (%)	Per cent sulfur in product: Gasoline by thermal cracking of residues					Catalytically cracked gasoline				
	Vene.	West Tex.	Middle East	Calif.	U. S.	Vene.	West Tex.	Middle East	Calif.	Mid-Cont.
0.5	0.13	0.09	...	0.37	0.08	0.09	0.05	...	0.28	0.05
1.0	0.17	0.22	0.26	0.62	0.15	0.12	0.12	0.09	0.44	0.09
1.5	0.21	0.32	0.36	0.93	0.22	0.16	0.18	0.13	0.70	0.13
2.0	0.26	0.43	0.42	1.2	0.35	0.19	0.24	0.16	0.89	...
2.5	0.31	0.54	0.48	1.43	0.43	0.22	0.30	0.19	1.07	...

Sulfur content of crude oil (%)	Per cent sulfur in product: Kerosine (375°-500° F.)					Diesel fuel (400°-700° F.)				
	Vene.	West Tex.	Middle East	Calif.	U. S.*	Vene.	West Tex.	Middle East	Calif.	U. S.†
0.5	0.12	0.27	...	0.15	0.07	0.38	...	...	0.44	0.27
1.0	0.20	0.42	0.19	0.40	0.16	0.52	0.72	0.80	0.77	0.65
1.5	0.32	0.61	0.23	0.63	0.27	0.75	1.02	1.02	1.16	1.0
2.0	0.46	0.58	0.24	0.87	0.35	0.98	1.37	1.06	1.56	1.22
2.5	0.60	0.60	0.24	1.10	0.37	1.2	1.65	1.15	1.90	1.48

*Excluding West Texas, Panhandle, and California. †Excluding California.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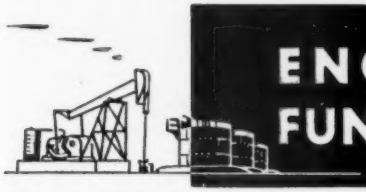


Graphical Estimation of Reserves From Decline Curves

by Ralph F. Nielsen*

IN order to estimate the total future production of a property it is often necessary to extrapolate the current trend to the limiting economic rate. The current trend may be represented by one of the standard forms of decline curves (Engineering Fundamentals No. 496). To extrapolate these it is desirable to plot the current rate in such a manner that a straight line is obtained. The total is found by a summation of the production increments as given by the extrapolated straight line.

Some confusion may arise from the fact that the data represents totals over a period. These figures may therefore best be regarded as representing the production rate in the middle of that period. Thus, if t is counted in months from September 1, 1950, the September figure corresponds to t = 0.5, October to t = 1.5, etc.

Exponential, or Uniform Percentage Decline

Example . . . The production should give a straight line on semilog paper (see Fig. 1). It is desired to estimate the reserves as of September 1, 1952, if the economic limit is 360 bbl. per month. The data to be used start with the October 1951 production. Hence t is counted from October 1, 1951, and the October production is the rate for t = 0.5. The limit, 360, is at t = 22.3. It is therefore desired to obtain the cumulative production from t = 11 to t = 22.3.

There are several convenient ways of obtaining this total, all of which amount to graphical or numerical integration. One way is to add the increments. Thus the production from t = 11 to t = 12 is given by taking P at t = 11.5, etc., for each month. For the last increment, t = 22 to 22.3, P corresponds to t = 22.15. The sum of the first 11 P's plus 0.3 of the last gives the total production.

If the total is to be obtained with a planimeter it is necessary to replot the curve from semilog to Cartesian paper (Fig. 2) and measure the area under the curve between 11 and 22.3. A few points from the semilog line, plus the terminal points, should be enough for the replotting. A proportionality factor for the planimeter readings is best determined by measuring a rectangular area with sides of convenient increments in P and t.

A rather simple and accurate formula for numerical integration is that known as Simpson's rule. The "area" in question, or a part of it, is divided into an **even** number n of vertical segments, bounded by P_0 and P_1, P_1 and P_2, etc., spaced equal distances Δt apart. The integral is then: $\Delta t/3\ [P_0 + P_n + 4(P_1 + P_3 + \text{etc.}) + 2(P_2 + P_4 + \text{etc.})]$.

For the present case the area from t = 11 to t = 23 may be divided into six parts. This integral is 2/3 [820 + 340 + 4 (720 + 540 + 400) + 2 (620 + 460)] = 6,640, P_0 corresponding to P_{11}, P_1 to P_{12}, etc. The value 0.7 P (at t = 23.65) is subtracted, giving the reserves as 6,640 — 224 = 6,416.

Hyperbolic, or Constant Decline of Decline Ratio

Example . . . The procedures are the same as in the previous example, except that log paper is used instead of semilog. The yearly productions, starting with 1945, are used as a basis (Fig. 3). If t is in years, the 1945 production is the rate at t = 0.5, etc. It is found that $t + 5\ (= t')$ must be plotted against P to give a straight line on log paper. The economic limit is 2,500 bbl. per year at $t' = 21.5$ or t = 16.5, and it is desired to estimate the reserves as of July 1, 1952, at t = 7.5.

The problem is then to integrate P from t = 7.5 to t = 16.5, and the three methods of the previous example are applicable. To use Simpson's rule it is convenient to divide the region from t = 8 to t = 16 into 4 or 8 strips of time intervals 2 or 1, and add the strips at the sides, each of width 0.5. To use a planimeter, the extrapolated line must of course be replotted on Cartesian paper. Simpson's rule gives 2/3 [3,800 + 2,550 + 4 (3,370 + 2,760) + 2 (3,040)] + 0.5 (3,860 + 2,520) or 27,823 bbl.

*Associate professor, petroleum and natural-gas engineer, Pennsylvania State College.

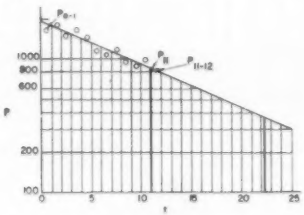


Fig. 1—Reserves from extrapolation of an exponential decline curve.

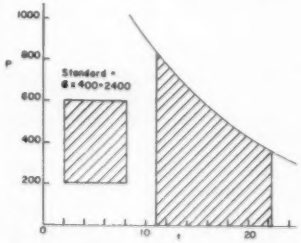


Fig. 2—Integration by means of a planimeter.

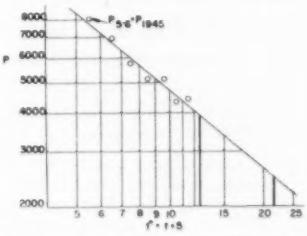
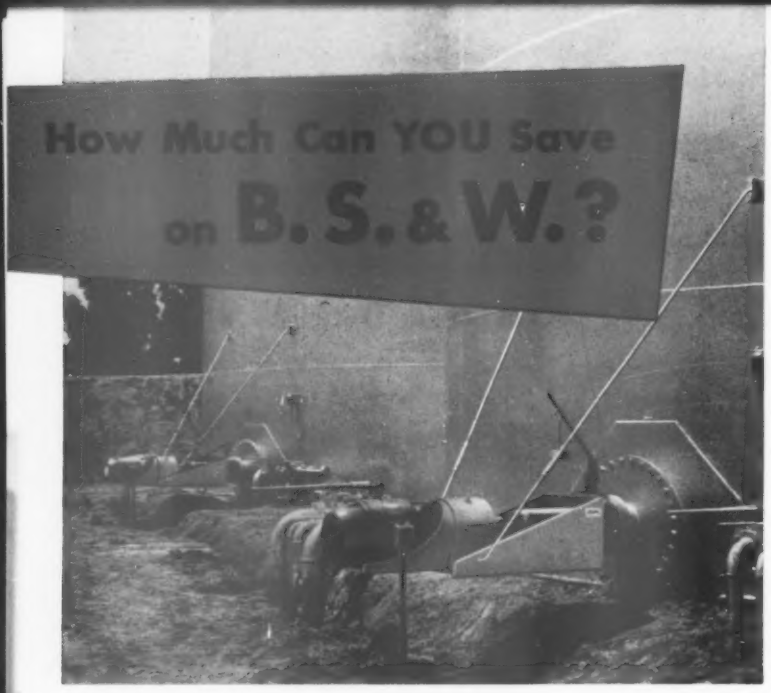
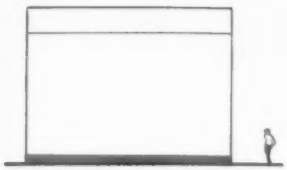


Fig. 3—Reserves from extrapolation of a hyperbolic decline curve.





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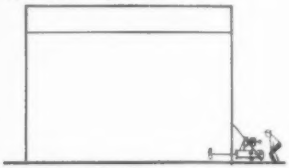

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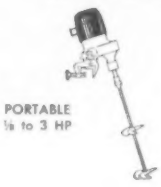

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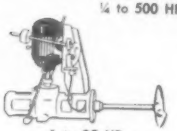

1 to 25 HP
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TOP ENTERING
¼ to 500 HP

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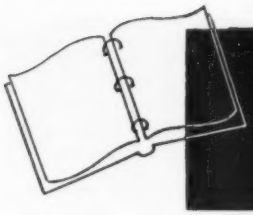


REFINER'S NOTEBOOK

Making Good Use of Pressure-Actuated Switches In Continuous Slurry Makeup Control

by W. B. Simon*

AN example given here of "gadgeteering" with pressure-actuated switches is that of providing a continuous makeup of a constant-density slurry at a variable rate as demanded by the use of the slurry within the process. Such an application might be possible in the refinery where chemicals are mixed for water treatment, or for other applications. Fig. 1 shows equipment which was originally used. A dry substance material is conveyed by a gravimetric feeder into a mixing tank. A level controller in the mixing tank throttles the flow of liquid which is used with the dry substance to make up the slurry. A rotameter measures the flow rate of the liquid and transmits a proportional pneumatic pressure to the variable speed drive of the gravimetric feeder.

The application is such that it would be entirely satisfactory in a number of applications. However, in this particular case, the draw from the mixing tank, although continuous, sometimes dropped to exceedingly low rates. When the flow rate as measured by the rotameter dropped to 10 per cent or less of the maximum range of the rotameter, the accuracy of measurement was not within the necessary limits to provide a uniform dry-substance slurry.

To overcome this problem, a pressure-actuated switch was installed in the output line from the level controller. The set point on this switch was adjusted so that when the flow control valve was throttled to a point where the flow was reduced to approximately 12 to 14 per cent of the rotameter range, the switch would energize a three-way solenoid-operated valve. Fig. 2 shows this system with the pressure-actuated switch and solenoid-operated valve installed.

When the demand as indicated by the output from the level controller is reduced to a predetermined point, the solenoid valve will cut off the control air to the flow-control valve, stopping the flow through the rotameter. With no flow, as indicated by the output from the rotameter, the variable-speed drive will stop the gravimetric feeder. The level in the mixing tank is not critical to a change of several inches, allowing sufficient output change from the level controller for a differential setting on the pressure switch to prevent undesirable on-off operation of the flow-control valve. This arrangement provides for smooth operation and accurate slurry density makeup for widely varying rates of flow from the slurry mixing tank. These modifications were made in the field, again with standard precision accessory items.

*General foreman, instrument department, Corn Products Refining Co., Corpus Christi, Tex. From paper presented at instrumentation symposium, Texas A. & M. College, 1952.

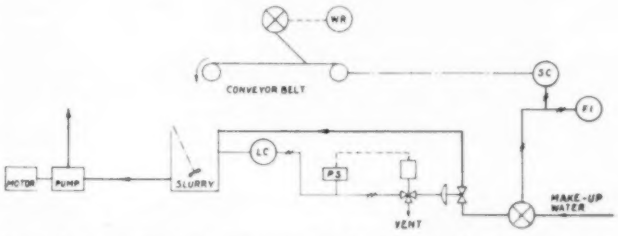


Fig. 2—System of Fig. 1 using pressure-actuated switch and solenoid-operated valve.

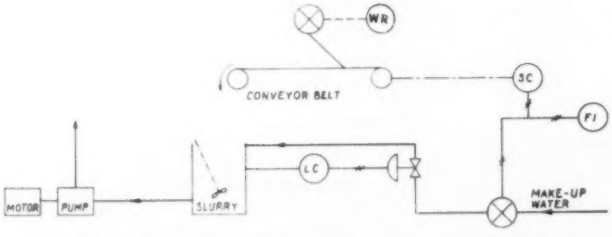
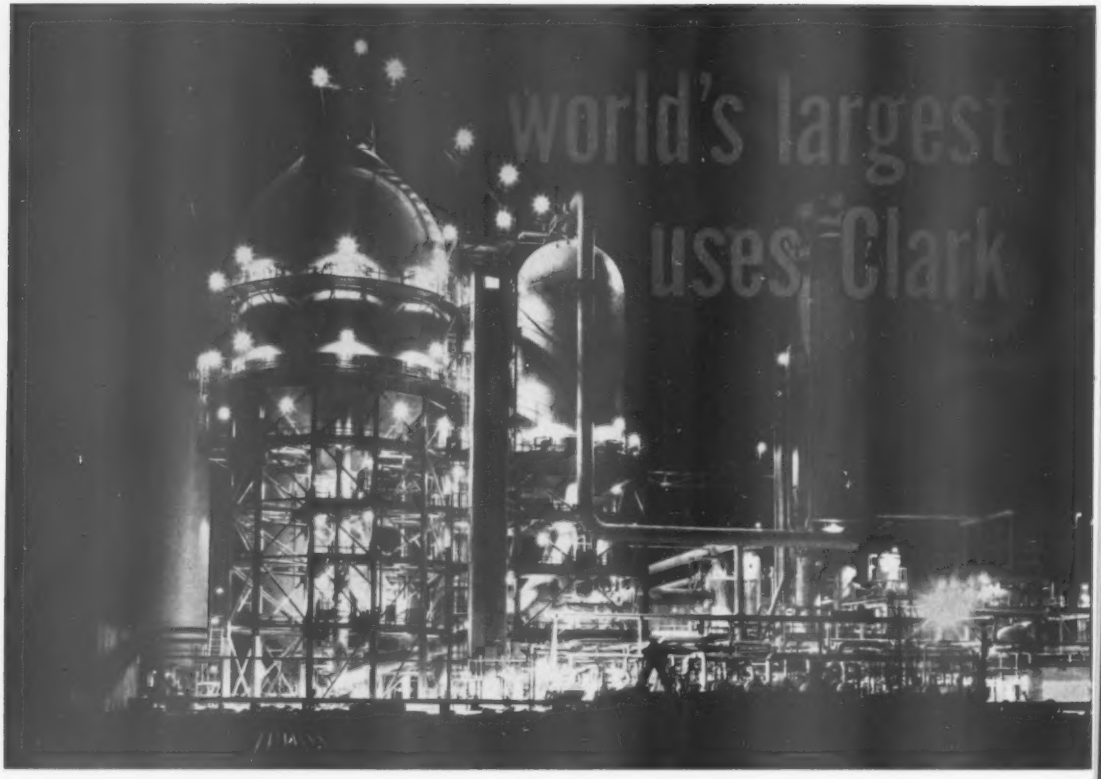


Fig. 1—Showing instrumentation for continuous makeup of constant-density slurry.



At Port Arthur, Texas, the Gulf Oil Corporation operates the largest fluid catalytic cracking unit of its type in the world. Thru-put of this huge 63,000 bbl. per day cracker is approximately 20 percent greater than any similar installation. *Clark Centrifugal Compressors — five of them — serve it exclusively!*

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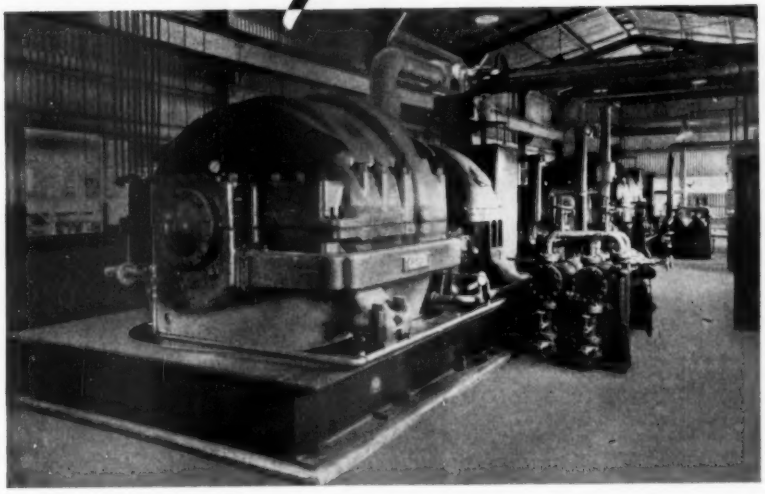
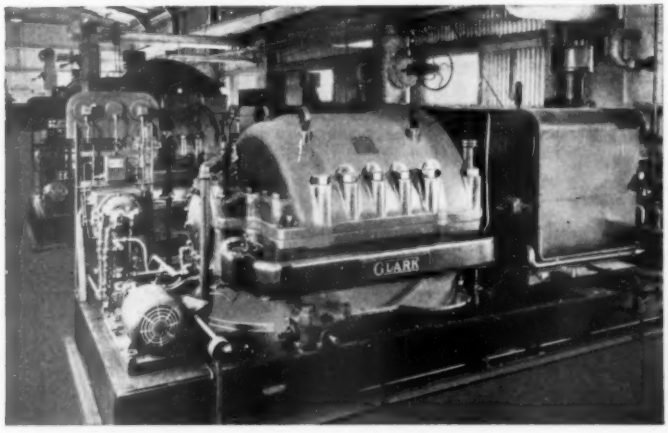


Two Clark No. 5 Multi-Stage Centrifugal Compressors, steam turbine driven, serving as main air compressors for Gulf Oil Corporation's Port Arthur, Tex., cat cracker.



Two No. 3 and one No. 2 Clark Multi-Stage Centrifugal Compressors are used in vapor recovery and propane refrigeration service, respectively.

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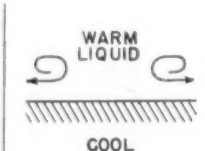
Part 7 of a series

by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between COOL HORIZONTAL WALL and WARM LIQUID



Liquid Movement: Natural Convection.

Wall Position: Facing Upward

Size of Wall: Large (over .25 sq. ft.)

EQUATION:

$$h_f = 0.08 \left[\frac{\rho^2 C \beta g \Delta t}{\mu k}\right]^{\frac{1}{3}}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq. ft.°F.

k - Thermal conductivity of liquid at t_f, in BTU/hr. sq. ft. °F./ft.

L - Length of wall, ft.

ρ - Density of liquid at t_f, lb./cu. ft.

C - Specific heat of liquid at constant pressure, BTU/lb. °F.

β - Coefficient of volumetric expansion of liquid at t_f. (cu. ft./cu. ft.)/°F.

g - Acceleration of gravity. 4.17×10^8 ft./hr.^{2}

Δt - Temperature difference between wall and liquid, °F.

μ - Viscosity of the liquid at t_f, lb./ft. hr.

t_f - Film temperature, °F. Assume to be arithmetic average of wall temperature and bulk gas temperature.

LIMITATIONS: Wall size over .15 ft. if tipped to vertical position.

SOURCES OF DATA: For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

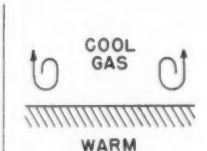
for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1198, 1696.
β -- see p. 200-202, 1875.
k -- see pp. 459-461, 1303, 1697.
C -- see pp. 225-235, 297, 1588, 1696.

REFERENCES:

1. The Basic Laws and Data of Heat Transmission, W. J. King, Mechanical Engineering, p. 500, May, 1932.
2. Introduction to Heat Transfer, Brown & Marco, p. 114.
3. Heat Transmission, William H. McAdams, pp. 237-251.
4. "Surface Heat Transmission," H. H. Heilman, Trans. Am. Soc. Mech. Engrs., FSP 51, 287-304, (1929).

B 2 a (2) (a)

COEFFICIENT of HEAT TRANSFER through FILM between WARM HORIZONTAL WALL and COOL GAS



Gas Movement: Natural Convection

Wall Position: Facing Upward

Size of Wall: Small (less than 2 ft. section.

EQUATION:

$$h_f = 0.71 \frac{K}{L}\left[\frac{L^3 \rho^2 C_p \beta g \Delta t}{\mu k}\right]^{\frac{1}{4}}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of gas at t_f, in BTU/hr. sq. ft. °F./ft.

L - Length of wall, ft.

ρ - Density of gas at t_f, lb./cu. ft.

C_p - Specific heat of gas at constant pressure, BTU/lb. °F.

β - Coefficient of volumetric expansion of gas at t_f. (1/°R.) (cu. ft./cu. ft.)/°F.

g - Acceleration of gravity. 4.17×10^8 ft./hr.^{2}

Δt - Temperature difference between wall and gas, °F.

μ - Viscosity of the gas at t_f, lb./ft. hr.

t_f - Film temperature, °F. Assume to be arithmetic average of wall temperature and bulk gas temperature.

LIMITATIONS:

Value of term $\left[\frac{L^3 \rho^2 g \beta \Delta t}{\mu k}\right]$ must be between 10^8 and 10^9.

SOURCES OF DATA: For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

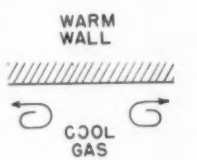
for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1198, 1696.
β -- see p. 200-202.
k -- see pp. 459-461, 1303, 1697.
C -- see pp. 225-235, 297, 1588, 1696.

REFERENCES:

1. Introduction to Heat Transfer, Brown and Marco, pp. 113-114.
2. "The Basic Laws and Data of Heat Transmission," W. J. King, Mechanical Engineering, 57, 550, May, 1932.

B 4 a (1) (a)

COEFFICIENT of HEAT TRANSFER through FILM between WARM HORIZONTAL WALL and COOL GAS



Gas Movement: Natural Convection

Wall Position: Facing Downward

Size of Wall: Small - less than 2 ft. section.

EQUATION:

$$h_f = 0.35 \frac{K}{L}\left[\frac{L^3 \rho^2 C_p \beta g \Delta t}{\mu k}\right]^{\frac{1}{4}}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of gas at t_f, in BTU/hr. sq. ft. °F./ft.

L - Length of wall, ft.

ρ - Density of gas at t_f, lb./cu. ft.

C_p - Specific heat of gas at constant pressure, BTU/lb. °F.

β - Coefficient of volumetric expansion of gas at t_f. (1/°R.) (cu. ft./cu. ft.)/°F.

g - Acceleration of gravity. 4.17×10^8 ft./hr.^{2}

Δt - Temperature difference between wall and gas, °F.

μ - Viscosity of the gas at t_f, lb./ft. hr.

t_f - Film temperature, °F. Assume to be arithmetic average of wall temperature and bulk gas temperature.

LIMITATIONS:

Value of term $\left[\frac{L^3 \rho^2 C_p \beta g \Delta t}{\mu k}\right]$ must be between 10^8 and 10^9.

SOURCES OF DATA: For physical constants for use in above equation see Chemical Engineers' Handbook, J. H. Perry, (1948).

for ρ -- see pp. 130-148, 175-195, 1583.
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k -- see pp. 459-461, 1303, 1697.
C -- see pp. 225-235, 297, 1588, 1696.

REFERENCES:

1. Introduction to Heat Transfer, Brown and Marco, pp. 113-114.
2. "The Basic Laws and Data of Heat Transmission," W. J. King, Mechanical Engineering, 57, 550, May, 1932.

B 4 a (1) (b)

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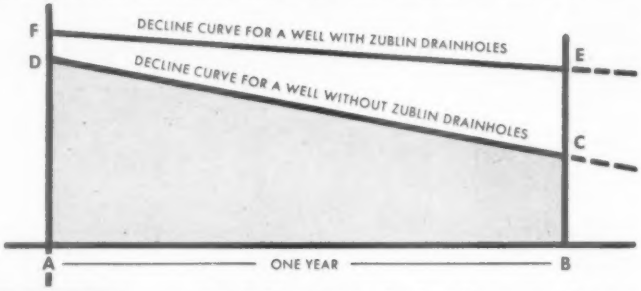

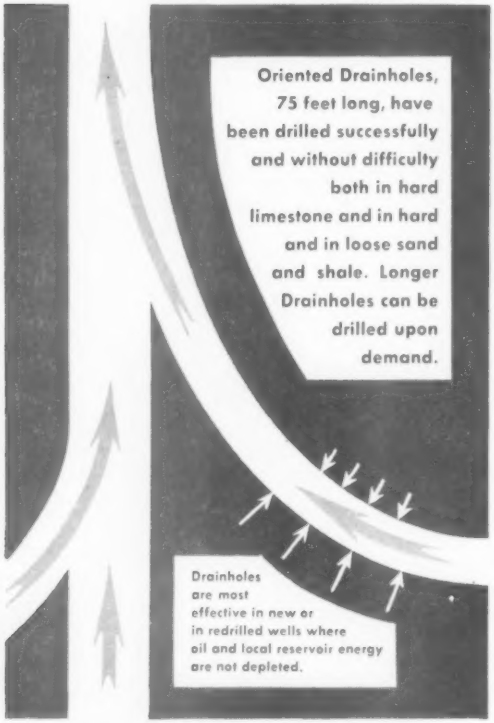
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How to Determine Oil-Sand Productivity From Drill-Stem Test

CORRECT determination of the productivity of an oil sand during drilling of an oil well is of major importance in field operations.

Basic data needed . . . Certain basic data are required, including the initial flowing pressure and the final flowing pressure. (This information is read directly from the pressure chart hereafter described.) This differential is equivalent to head of fluid recovered.

To convert this difference of weight into barrels of oil per day, the type of fluid recovered must be known as well as its weight in pounds per square inch of head.

Thus:

(Final flowing pressure) — (Initial flowing pressure) = fluid head recovered (1)

Substituting:

479 psig. — 78 psig. = 401 psig.

This differential, i.e., 401 psig., divided by the weight per foot of the fluid recovered, will give the height of the head required to cause the differential recorded.

Assume that the oil recovered tests 35° A.P.I. and has a specific gravity of 0.8498. (A column of water 1 ft. high, at 62° F., exerts a pressure on the base with a force of 0.434 psi.)

To convert this density to pounds per linear foot of head:

Weight of water × specific gravity of oil = fluid weight per linear foot (2)

Substituting:

0.434 × 0.8498 = 0.3688 lb./ft.

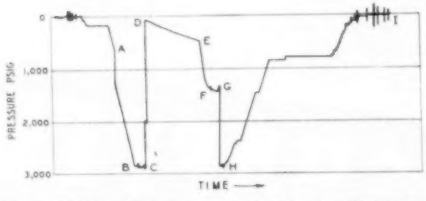

Fig. 1—Drill-stem-test pressure chart. (Courtesy Halliburton Oil Well Cementing Co.)

Knowing the weight per foot of the fluid recovered, the necessary footage fillup required to give the weight of the observed fluid head is calculated as:

Weight of fluid head ÷ fluid weight per foot = calculated footage recovery (3)

Substituting from (1) and (2):

401 ÷ 0.3688 = 1,087 ft.

Problem . . . Determine drill-pipe capacity to convert calculated footage recovery in barrels. Drill pipe used is 4.5-in. o.d. A.P.I. F.H. weighing 16.6 lb. per ft. Capacity of drill pipe is reported in "Howco Cementing Tables" as 0.01422 bbl. per linear foot for 3.826 i.d. (4.500 o.d.) drill pipe for 16.6 lb. per ft. weight with threads and couplings.

Convert fillup to barrels.

Footage fillup × barrels per linear foot fillup = total barrels fillup (4)

Substituting:

1,087 × 0.01422 = 15.45 bbl.

Convert barrels of fillup into barrels produced per day. (Period of fillup was 1.5 hours.)

Hourly rate is 15.45 ÷ 1.5 = 10.3 bbl. per hour (5)

Daily rate is 10.3 × 24 = 247.2 bbl.

Productivity index . . . In the case cited above, the well did not flow during the drill-stem test. However, in those cases where the well flows stock-tank oil during the drill-stem test, an observed productivity index can be recorded simply by dividing the daily oil rate by the pressure differential between the true static pressure and the **average** flowing pressure.

The static pressure is obtained by shutting in the well; after a sufficient number of hours have elapsed, a bottom-hole pressure bomb is run at intervals. From these data, a pressure vs. time buildup curve is plotted from which the true static pressure is obtained.

The pressure recorder, an integral part of each drill-stem test, affords a graphic record on a pressure vs. time chart of each bore-hole event from the time the tool is lowered into the hole on drill-pipe until it is removed. Correlated with other data such as fluid recovery in drill pipe, and surface blow, the pressure record is invaluable in recording basic data for determination of the productivity of the formation.

The pressure record made during the drill-stem test discussed in the case example cited above is described as follows:

Testing tool is made up with a 5¾-in. by 21-ft. anchor and lowered into the hole to 5,433 ft. total depth (packer depth was 5,412 ft.). Bottom-hole choke setting was ½ in.

Pressure conditions while running testing tool into hole are shown at point A in Fig. 1. Broadness of the line results from periodic aberrations in pressure imparted on the bottom-hole-pressure recorder when drill pipe is picked up to pull slips, and again when setting slips which jars drill stem. The smoothness of line indicates that no difficulty was experienced in getting packer down to packer setting point.

Pressure remains constant at horizontal line segment B while surface control valves are connected to drill stem for checking surface blow. This is the initial hydrostatic mud pressure recorded as 2,886 psig.

Highest pressure of slightly over 3,000 psig. is recorded at point C which is the squeeze effect of setting the packer. This pressure surge is caused by application of pressure after rubber element of packer is expanded against walls of the hole to insure a good pressure seal. Since mud under packer cannot bypass, there is a higher pressure exerted on pressure recorder.

No water cushion or blanket was run with this test. Hence, when testing tool was opened, pressure dropped to a low figure of only 78 psig., initial flowing bottom-hole pressure. The testing tool was open for a period of 1.5 hours. Tool opened with a good blow and gas rose to surface in 33 minutes. Pressure buildup was constant for the duration of test, and when testing tool was closed at point E, the final flowing pressure was 479 psig. From point E to F there was an additional pressure buildup to 1,419 psig. during the closed-in pressure interval of 15 minutes.

Packer was unseated at point G allowing weight of entire column of drilling mud to be exposed to pressure recorder. Pressure rose sharply to a maximum at point H which is the final hydrostatic mud pressure of 2,886 psig.

Testing tool was pulled from the hole at the end of the trip at point I. Fluid recovery on this test in drill pipe was 1,420 ft. of oil and gas-cut mud.

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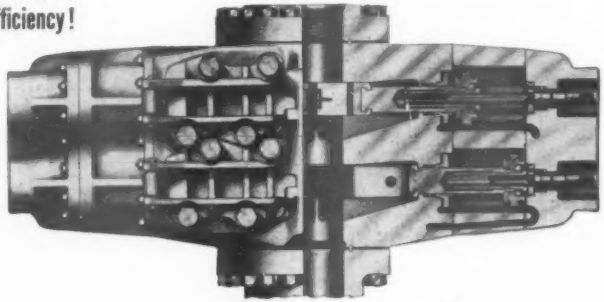

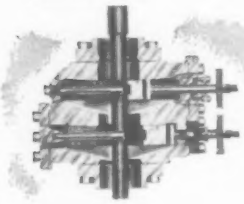

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PIPE LINES

More Gas Sought

Northern to spend huge sum to pipe it in from Texas

WASHINGTON.—Northern Natural Gas Co. has filed with the Federal Power Commission its plans for a constructions program which would increase its capacity by about 300,000,000 cu. ft. of gas daily.

The $70,000,000 expansion would boost Northern Natural's capacity to about 1.112 billion cubic feet.

The project would include construction of a total of about 442 miles of main-lines, installation of about 73,600 hp. in new and existing compressor stations, and laying of numerous laterals.

The additional system capacity would be used to transport 300,000,000 cu. ft. of gas daily supplied by Permian Basin Pipeline Co. Permian already has an application before FPC to build a 384-mile system in Texas and New Mexico.

Increased gas supplies, Northern says, will be used to supply additional contract-demand volumes which Northern's customers have requested, and to provide about 17,000,000 cu. ft. of gas for service to about 30 communities in Iowa, Minnesota, Nebraska, and South Dakota which do not now have gas.

First year . . . The building program during the first year would cost $45,570,000. It would include 226.5 miles of main-line additions and 42,800 hp. in compressor capacity.

The next year the company would lay about 215 miles of main lines and install about 30,800 hp. in compressors at a cost of about $24,250,000.

The new facilities would be located in Texas, Oklahoma, Kansas, Nebraska, Iowa, Minnesota, and South Dakota.

Pipe-Line Contractors Find September a Lucrative Month

TULSA. — September has been a good month for pipe-line contractors.

Largest of several major projects for which contracts were let this month are Texas Eastern Transmission Corp.'s 315-mile, 24-in. gas-supply line from Provident City, Tex., to Castor, La., and a 77-mile segment of West Texas Gulf Pipe Line Co.'s big crude line. The latter is a 20-in. section extending west from Longview, Tex.

These contracts were let to H. B. Zachary Co. and R. H. Fulton & Co., respectively.

Other major contracts were let by:

. . . Sinclair Pipe Line Co., 600 miles of 8, 12, and 14-in. pickup, contracted by J. L. Cox & Son, Raytown, Mo.

. . . Sun Pipe Line Co., 108 miles of 8-in. from Fostoria to Hudson, Ohio, contracted by Britton Contracting Co., Inc.

. . . Sinclair Pipe Line Co., 45 miles of 22-in. from Pontiac, Ill., in a northeasterly direction, contracted by O. R. Burden Construction Corp. Burden will start another spread soon on about 40 miles of 22-in. for Sinclair.

. . . Kansas - Nebraska Natural Gas Co., 50 miles of 10-in. from Ogallala to North Platte, Neb., contracted by Engineering Construction Co., Tulsa.

Considerable other major contracts have been revealed in early issues this month. One of these was Salt Lake Pipe Line Co.'s parallel products line from Salt Lake in Boise.

Right-of-Way Fight Flares Up Again in New England

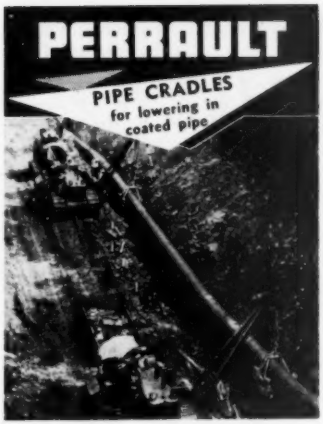
The fight being waged by some New York and Connecticut property owners against rights-of-way for the gas pipe lines to New England has flared up again.

Eighty-one property owners in northern Westchester County, New York, recently petitioned New York Public Service Commission to halt construction of Algonquin Gas Transmission Corp.'s line until the commission promulgates its safety code.

One of the leaders of the group accused the company of rushing through condemnation proceedings, failing to restore right-of-way property to its original condition, and of complying only with minimum safety requirements.

Northeastern Gas Transmission Co., the other line reaching the New England market, ran into a hot legal fight in taking its line across Fairfield County, Connecticut, also a New York City suburban area. Northeastern is taking gas from Tennessee Gas Transmission Co. Algonquin's supply will come from Texas Eastern Transmission Corp.

The New York Public Service Commission recently drafted a 31-point safety code for natural-gas pipe lines after a public hearing on pipe-line safety. The code applies to lines carrying gas at internal pressures of more than 125 psi. Generally, it calls for compliance with the American Standards Association's code for pressure piping with some further requirements. The commission has asked for comments from the utilities on the proposed state code.



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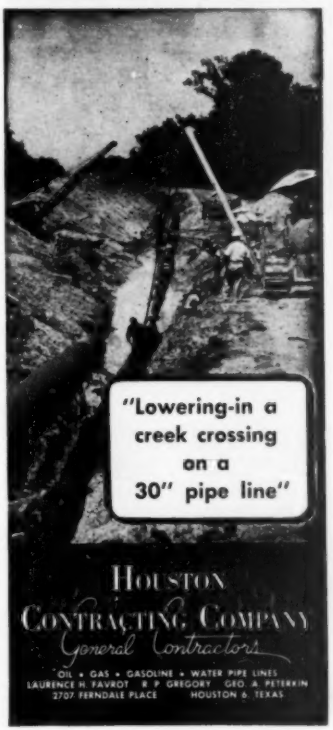

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Transco Raises Capacity of System to 555,000 M.c.f.

HOUSTON.—Transcontinental Gas Pipe Line Corp. has completed installation of a compressor units raising its daily delivery capacity to the authorized maximum of 555,000,000 cu. ft.

The entire 259,210 hp. of the company's presently certificated capacity became available in August when the third steam centrifugal unit at the Eunice, La., compressor station was placed in service.

Beginning this month, Transco's actual deliveries are expected to average well above 500,000,000 cu. ft. a day.

Missouri Public Service to Lay 136-Mile Gas System

WASHINGTON.—Missouri Public Service Co. has applied to the Federal Power Commission for authority to lay a 136-mile natural-gas system in Missouri.

The proposed project includes about 110 miles of 8 and 10-in. main line and about 27 miles of laterals. The system would connect with Panhandle Eastern Pipe Line Co.'s system near New Franklin and extend through Howard, Carlton, Linn, Livingston, and Grundy counties.

Capacity of the system would be in excess of 21,000,000 cu. ft. It would cost a little over $5,000,000.

Texas-New Mexico Lets Contract for New Crude Line

DALLAS.—Texas-New Mexico Pipeline Co. has awarded contract to Bishop & Lock Construction Co. for approximately 53 miles of crude-oil pipe lines in southeastern New Mexico.

The lines will extend existing sweet crude-oil-gathering facilities of the company in Lovington pool of Lea County to the Saunders area to the northwest. New construction calls for approximately 42 miles of 8⅝-in. line, 4 miles of 6⅝-in. and 7 miles of 4½-in. line. Work was scheduled to begin immediately.

Spraberry Producers May Get First Major Gas Outlet

EL PASO, Tex.—If El Paso Natural Gas Co.'s present plans are carried out, the Spraberry producing area in West Texas may get its first major outlet for natural gas.

El Paso applied to the Federal Power Commission recently for permission to carry out a construction program which would increase capacity of its trunk

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system from West Texas and New Mexico fields to California by 400,000,000 cu. ft. of gas daily *(The Oil and Gas Journal, September 22, page 166)*. Three-fourths of this gas would come from Permian basin fields in West Texas and New Mexico, with the remainder gathered from fields in the San Juan basin.

On the Spraberry trend, El Paso plans to lay a field gathering system to pick up low-pressure casinghead field gas from Driver, Midkiff, and Pembrook fields. This system will deliver gas to new natural-gasoline plants in each of these fields where gas-purification and dehydration facalities will be provided. Field compressor stations will be built to boost the pressure of residue gas to transmission-line requirements.

The Spraberry program includes 108 miles of 24-in. line running from the Spraberry district north to Wasson field of southwestern Yoakum County, and about 6½ miles of 16-in. from the Driver field plant to a connection with the Spraberry-Wasson line.

El Paso is the second major firm to seek FPC approval of a supply system in the Spraberry. The first was Permian Basin Pipeline Co., in which Northern Natural Gas Co. has a controlling interest. So far, FPC has not acted on Permian's application.

Third Price Spread Laying 26-In. Loop for Texas Gas

BARTLESVILLE, Okla.—H. C. Price Co. is putting a third spread to work laying pipe for Texas Gas Transmission Corp.

Price has a contract to lay 363 miles of 26-in. loop line for Texas Gas. The latest spread assigned to the project will lay about 59 miles of loops northeast from a point near Memphis. First pipe is scheduled to be laid this week. The brush gang is already at work.

The second Price spread, headquartered at Dyersburg, Tenn., has been laying pipe since September 8. The third, located at Cleveland, Miss., has been in action for some time.

CRC Adds to Staff for U. S. Pipe Line Co. Job

HOUSTON.—CRC Engineering Co., holder of contract for designing United States Pipe Line Co.'s giant new line to carry products from the Gulf Coast to the East Coast, has announced plans for increasing its staff.

New members include: J. P. Bristow, recently a vice president of Fish Pipeline Construction Co. Bristow directed engineering for Fish on Texas Illinois Natural Gas Pipeline Co.'s line from South Texas to Chicago and previously was affiliated with Tennessee Gas Transmission Co. and Northern Natural Gas Co.

Frank Edward Hangs, a compressor-station expert, previously with Transcontinental Gas Pipe Line Corp. and Texas Pipe Line Co.

W. T. Pyott, formally chief engineer for Mannix, Ltd., in Calgary, Alta., and assistant chief engineer for Great Lakes Pipe Line Co.

John C. Graper, formerly with Standard Oil Co. (Ind.)

E. L. Beeman, formerly manager of the distribution division of National Cooperative Refinery Association at McPherson, Kans.

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REFINING

Refining Sessions Scheduled For Maintenance Conference

CLEVELAND.—Two sessions of the coming Plant Maintenance Conference to be held here January 19-22 have been set aside exclusively for a discussion of maintenance problems in refineries.

The special sessions are being held due to the sky-rocketing costs of maintenance in the petroleum industry and the added engineering and personnel problems due to increasing mechanization.

Two sessions will be set aside for chemical plants.

The refining sessions will be in the form of round-table discussions and will be conducted from 2 to 4:30 p.m., January 20 and 21.

More than 60 other meetings are scheduled to be held during the conference. These will be concerned with preventive maintenance, sanitation, lubrication, incentive systems, power plants, pumps and piping, maintenance stores, training workers, maintenance budgets, lighting, work standards, building maintenance, maintenance of electrical and mechanical equipment, corrosion control, and similar problems.

The conference will be conducted jointly with the Plant Maintenance Show, where thousands of machines and products will be exhibited.

Radioactive Isotopes Used To Test Quality of Asphalt

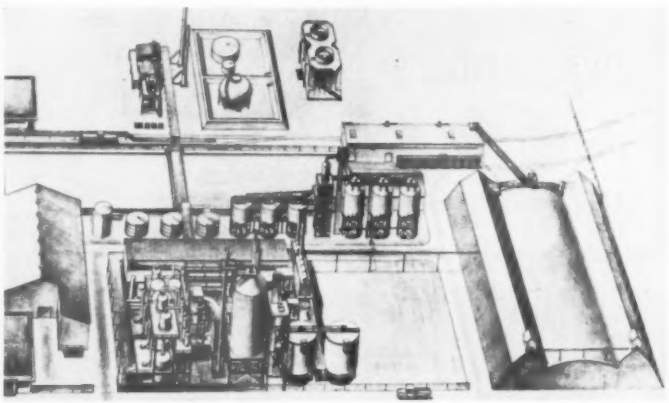
PHILADELPHIA.—A new job for radioactive isotopes has been added to the long list of uses which the petroleum industry has made of these byproducts of the atomic-energy program.

At the Atlantic Refining Co.'s research laboratories here radioactive calcium is employed to test the binding qualities of paving asphalt.

Road stones are soaked in a water solution containing the calcium isotope. When the stones are dried, a thin film of the calcium remains on their surface. The rocks are then coated with the asphalt to be tested and soaked in water for a specified time.

If the asphalt is of low quality, it will partially separate from the stones, and the calcium compound on the exposed surface will become dissolved in the water.

Following the soaking operation, the water is withdrawn and evaporated. By measuring the radioactivity of the residue with a General Electric device termed a scintillation counter, a meas-



More Catalyst Coming

Construction is scheduled to begin in the fourth quarter on Filtrol Corp.'s new $5,000,000 alumina and ammonium-sulfate plant at Vernon, Calif. Wright W. Gary, president of Filtrol, said the plant not only will produce highly pure alumina, but will process it further to produce alumina catalyst, stabilized alumina catalyst, and impregnated alumina catalyst. The company will market the catalyst to the petroleum industry for use in the manufacture of gasoline by catalytic reforming and to the chemical industry for various catalytic processes, such as oxidation, dehydrogenation, and ammoniation. Shell Chemical Corp. will market the ammonium sulfate output. Engineering and design of the new plant will be handled by J. H. Pomeroy Co., Inc., San Francisco. The plant will be in operation in the fourth quarter, 1953.

UNSURPASSED

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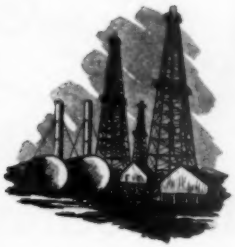

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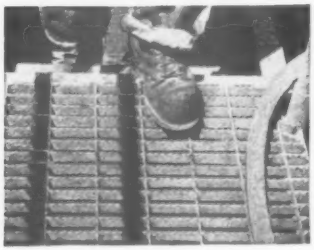

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Petroleum Packaging Group Agrees on Standardization

NORFOLK, Va. — The Petroleum Packaging Committee, a nation-wide group of oil executives revealed that it has reached agreement on four major points in its campaign to standardize specifications for containers for petroleum products.

At its recent session here at the Norfolk Naval Supply Center, the group agreed on standardization of: (1) A 120-lb. universal grease drum, (2) a 1-qt. motor-oil can, (3) 1-pt., 1-gal., and 2-gal. motor-oil cans, (4) an expendable pallet for refined wax.

Exact specifications of the containers were not disclosed. Recommendations of the group on the grease drum and the 1-qt. oil can will be made to the American Standards Association. Specifications on the other cans and the expendable pallet will be sent to the American Petroleum Institute and National Lubrication and Grease Institute for further examination. The pallet is of the type designed for holding refined wax in either 55-lb. cartons or 10½-lb. cakes.

After further study by a military subcommittee of the packaging group, recommendations will be made on standardizing a 55-lb. carton which will contain five cakes of refined wax.

The committee's next bimonthly meeting will be held October 20 in New York. It will meet at Port Arthur, Tex., in December.

Navy Approves Amyl Nitrate Blend as Cetane Improver

NEW YORK.—A cetane improver consisting of a blend of primary amyl nitrates has been approved by the U. S. Navy's Bureau of Ships for use in diesel fuels purchased by that service.

The additive called DB-36 Amyl Nitrate was introduced 6 months ago by Ethyl Corp. and has undergone extensive tests.

By improving the ignition quality of middle-distillate blends, the additive will in effect expand the supply by bringing substandard fuels up to acceptable specifications. It is expected to permit the blending of more cracked stocks in diesel fuels.

Further, by blending various amounts of the additive to bring diesel-fuel grades to uniform cetane number, it will promote the design of better engines by narrowing the range of ignition qualities for their specified fuels.

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NATURAL GAS

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Steep hike in rate cases creating serious situation

WASHINGTON.—The Federal Power Commission is having a rough time trying to keep up with the current flood of rate-increase applications.

Wholesale rate-increase applications totaling more than $140,312,000 annually were acted upon by FPC during the year ended June 30, 1952. On top of this almost $20,000,000 more in applications were filed during June but had not been acted upon by the commission as of June 30. Since June more than $54,000,000 more in applications have been filed.

Total increases filed during the fiscal year ended June 30 are more than six times over those filed in the previous year and more than 200 times greater than those in fiscal 1949.

Status of applications . . . Thomas C. Buchanan, chairman of FPC, said the commission suspended more than $139,000,000 of the $140,312,000 total for fiscal 1952. Of the suspended filings, it disallowed more than $22,000,000, approved $15,295,000, and permitted the companies to withdraw more than $7,000,000. Of the remaining $94,500,000, about $56,000,000 was in effect under bond and about $58,500,000 was still under suspension.

The commission completed action this year on carryovers from preceding years totaling $65,000,000. On June 30, however, there still remained a backlog of more than $104,000,000.

Situation serious . . . Buchanan said the flood of applications is creating an extremely serious situation. All applications must be carefully and thoroughly studied, he said, and this often necessitates lengthy hearings. Since the commission now has only 671 employes, as compared with 789 in 1949, the task has become virtually impossible.

In some cases, he said, companies have filed applications for a second and even a third rate increase before the first one is acted upon.

United Fuel Gas to Expand Storage Program in East

WASHINGTON.—United Fuel Gas Co., Charleston, W. Va., has revealed plans to expand its underground-storage operations.

In an application filed with the Federal Power Commission, United Fuel asked approval of construction of about 50 miles of pipe lines, and a 2,640-hp. compressor station. This would cost an estimated $6,088,890.

It also plans to acquire leases, drill wells, and install field lines for a proposed new storage pool. The application did not reveal location of the pool. Cost of this phase of the program is set at about $1,885,800.

The proposed compressor station would be located in Wood County, West Virginia, at an existing storage pool, and the new pipe line would extend south from the station to the company's existing Lanham station in Putnam County, West Virginia.

The line and station would be used to carry and compress gas for injection in and withdrawal from existing pool.

Demand Soaring

PAD says need for gas to jump 40 per cent by 1955

WASHINGTON. — The gas utilities of the country must prepare to meet an increase in demand of 40 per cent by 1955, the Gas Industry Advisory Council was told by Petroleum Administration for Defense officials September 19.

On the basis of a recent survey, Assistant Deputy Administrator Howard B. Noyes told the council, the 1955 demand will approximate 69,800,000,000 therms. That will be 20,100,000,000 therms more than the 1951 demand and 50,000,000,000 therms above the 1941 usage. (A therm is 100,000 B.t.u., or about 100 cu. ft. of gas).

By 1955, the survey concluded, natural gas will represent 96 per cent of the total consumed, or 66,900,000,000 therms.

Most of the increase in demand will come from residential space heating, but industrial consumption will continue to account for the major part of total sales.

Basis for forecast . . . The PAD report was assembled from forecasts by the utilities of their probable demand and sales, based on the assumption that (1) weather conditions in their areas will be normal; (2) industrial production will increase steadily through 1953 and thereafter the increase will taper off; (3) no additional government controls will be imposed on business operations; (4) no general full-scale war; (5) all steel requirements will be met; and (6) natural gas will be available from producers for pipe lines.

Expansion . . . The Defense Production Administration has approved a gas-expansion program proposed by PAD, calling for the construction next year of 7,200 miles of large-diameter transmission lines and 17,700 miles of smaller field, gathering, and distribution lines.

PAD officials, however, warned the council that if any of the assumptions on which its demand forecast were based do not prevail the expansion of service may be affected.

Appeal of Ruling on Texas Tax Set for January 21

AUSTIN.—The battle over the legality of Texas' gas-gathering tax isn't over yet.

The dispute is going to go before the Court of Civil Appeals here, where arguments will be heard January 21.

The three-man court will hear the state's appeal from a ruling by District Judge Jack Roberts' judgment that the new tax is an unconstitutional burden on interstate commerce. The test cases involve Panhandle Eastern Pipe Line Co., Michigan-Wisconsin Pipe Line Co., and Amarillo Oil Co. These were selected as representative of more than 50 suits filed by firms protesting the tax.

Protested payments now total $6,614,563 since the tax went into effect 11 months ago. This is well over half of the total payment of about $10,800,596.

An opportunity for changing the law will exist when the Texas Legislature meets in January. Opponents of the law, however, say no valid tax can be applied to gas after it leaves the well head en route to other states.

Revised Development Plan O.K.'d for Oakford Project

WASHINGTON.—New York State Natural Gas Corp., New York, and Texas Eastern Transmission Corp., Shreveport, have revealed plans to expand development operations in their Oakford underground storage area in Westmoreland County, Pennsylvania.

The Federal Power Commission last week approved a revised development program which calls for drilling 59 new wells, reworking an additional 32 wells, replugging an additional 20 abandoned wells, and reconditioning 111 more abandoned wells thus making a total of 373 wells requiring work instead of the original 211.

Authorization for the original program, which was estimated to cost about $40,773,000, came through in November 1950.

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Drilling Contractors

Operating Rigs Increase 165 During Past Month

The number of operating rotary rigs in the United States and western Canada continues to increase. Additional rigs put back to work during the week ended September 22 boosted the total to 2,635, the greatest number since the middle of July when the drilling industry was being forced to curtail operations because of shortages of pipe occasioned by the steel strike. There now are 165 more rigs running than there were a month ago when the number dropped to its lowest level following the strike. All areas, except the Rocky Mountains reported increases in drilling during the past week. In the Rocky Mountain region, where the number of active rigs has continued at record levels, the decrease of 3 rigs represented only a minor, routine fluctuation.

ACTIVE ROTARY RIGS*
(United States and Western Canada)

Area	Week ended 9-22-52	Change week ended 9-15-52	Change week ended 9-24-51
Gulf Coast	515	+12	-- 77
N. & D. Tex.-N. M.	735	+11	—256
Ark.-N. La.-E. Tex.	138	+ 2	— 28
Oklahoma	335	+14	+ 6
Kansas-S. Nebraska	158	+ 3	— 31
Illinois-Eastern	156	+11	— 3
Rocky Mountains	252	— 3	+ 48
Pacific Coast	160	+ 2	— 28
Total U. S.	2,449	+52	—369
Western Canada	186	+ 1	+ 41
Total	2,635	+53	—328

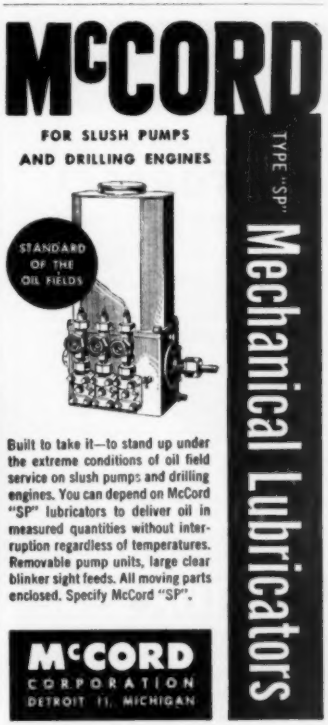
*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Gulf Coast and Arkansas-North Louisiana-East Texas areas are shown on pages 356 and 357.

Johnson & Flescher Drilling Co., Oklahoma City, is drilling on a 6,600-ft. Logan County, Oklahoma, contract it has with Ray P. Diehl, Oklahoma City operator. Location of the test, 1 Ellis, is 8 miles east of Guthrie, in the SE SW SW 14-16n-4w. Wilcox sand is the objective.

Noble Drilling Co., Tulsa, is the contractor on a new wildcat operation which Continental Oil Co. has projected for the North Geary area of Natrona County, Wyoming. The test will be Continental's 1 Unit, with location in the NW NE NE 10-34n-78w.

Independent Drilling Co. has a rig running on a rank wildcat test located in Bon Homme County, in the extreme

Cecil N. Housh (top left), coowner of Housh Drilling Co., Houston, and his superintendent, J. H. Parrish (top right), with one of the company's crews on the floor of a rig drilling a deep well for Pan American Production Co. in the South Gillock field, Galveston County, Texas Gulf Coast. Crew members are: E. E. Tessier and L. A. Wilson (driller), top, left to right; and J. A. Billingsley, W. D. Womack, and Sid Bear, bottom, same order. Tessier and Parish have been with the company since 1936. The company, one of the leading contracting firms on the Gulf Coast, has eight rigs in operation. (Picture by courtesy of Mission Manufacturing Co., Houston.)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south central part of South Dakota. Contract is with Bon Oil Exploration Co. Test is at 1 Jelsme, in the C SE SE 10-93n-60w.

Longhorn Drilling Corp., San Antonio and Three Rivers, Tex., has contracted for an 8,000-ft. wildcat test to be drilled for Humble Oil & Refining Co. at 1-B W. W. Rhode, in the Gustav Frasch Survey 82, in McMullen County, South Texas. It also is starting a projected 7,500-ft. wildcat in San Patricio County for P. R. Rutherford and Henderson Coquat. The latter test, 1 J. R. Knight, is located about 5 miles northwest of Edroy.

J. B. Fletcher Drilling Co., Shreveport, is drilling for Union Producing Co. at 1 Plant, an extension test south of the discovery producer of the new Muldon field, in Monroe County, Mississippi. The test, in 27-15s-6e, is projected to 6,050 ft.

Lyle Cashion, Inc., Jackson, Miss., has the contract for a new test which Barnett Serio and Norman Germany are starting in the Possum Corner area of Wilkinson County, southwestern Mississippi. Location is for 1 Leak, in 30-5n-2w.

Crow Drilling Co., Shreveport, has contracts from Carter Oil Co. for two wildcat tests in Mississippi, one to be drilled in Clay County, and the other in Chickasaw County. The former, 1 McFadden, located in 36-16s-5e, is projected to 9,000 ft. The other, 1 Baskin heirs, in 19-14s-5e, will go to 4,000 ft.

Clark Drilling Co., Billings, Mont., has a new wildcat operation under way at Freeman Gulch in Moffat County, northwestern Colorado, where it is drilling for Utah Southern Oil Co. at 1 Unit, in the C SW SW 11-5n-96w.

Dakota Basin Drilling Co. is contractor on a wildcat test which Emil B. Kucera is starting at 2 Barker, in the NW NE NW 34-6s-2e, Custer County, southwestern South Dakota.

Duke Petroleum Co., Calgary, has the drilling contract for a wildcat test which Antone Petroleums, Ltd., and associates have projected for the Delia area, 75 miles northeast of Calgary, in southern Alberta Province, Canada.

Wheless Drilling Co., Shreveport, has a new, deep operation under way in the Longwood field, Caddo Parish, Louisiana, where it is drilling for Phillips Petroleum Co. under contract. The new test, 1 Dole, in 5-18n-16w, is ¾ mile southeast of the field's Cotton Valley discovery well, also drilled for Phillips.

Hawke Drilling Co., Ltd., Regina, Sask., is drilling for the account of its parent company, Canadian Devonian Petroleums, Ltd., and Creekside Oil Co. at a wildcat location 1½ miles southeast of production in the Virden area, in Manitoba Province.

Quad Drilling Corp., Bossier City, La., is drilling for Sneed Brothers at a projected 3,500-ft. Travis Peak wildcat test, 1 Armstrong, in the Falcon area, northwestern Columbia County, Arkansas. Location, in the C NW NW 10-15s-22w, is along a fault line extending southeastward from the Falcon field, in Nevada County.

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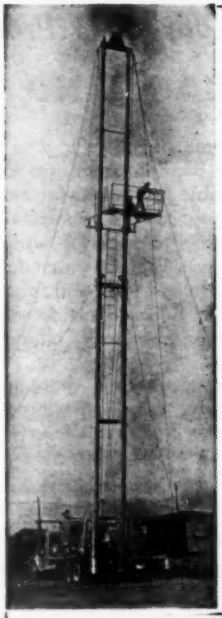

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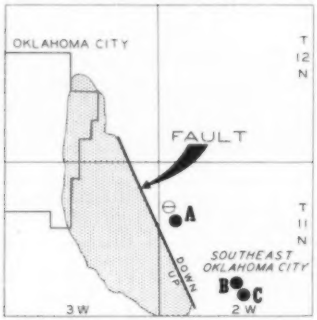
Revived Activity at Oklahoma City



THE recent discovery of production in the Pennsylvanian unconformity sands just east of the major field fault that marks the eastern boundary of Oklahoma City field gives the green light to revived exploration activity in the area.

Oklahoma City field has the greatest cumulative production of all Oklahoma fields, boasting a total of 684,770,000 bbl. up to August 1 this year. The field produced 6,303,000 bbl. of oil last year from 617 wells. Daily average production in the field today is about 15,700 bbl. from 585 producing wells. The total reserves of the field are estimated at 750 million barrels.

The Oklahoma City structure is a faulted anticline. Formations ranging from Mayes (Mississippian) to Arbuckle lime (Cambro-Ordovician) were upthrown, truncated, and then buried under Cherokee shale and succeeding beds of Pennsylvanian age. The core of the structure is Arbuckle limestone, surrounded on the west by Ordovician strata sequences in a semicircular pattern. The fault that has dropped the Mississippian down to Arbuckle level cuts across the side of the dome to the east. This fault has a maximum displacement of about 2,000 ft. in the middle, the fault scarp being 250 ft. high.

Oklahoma City field produces from rich pay zones in the Arbuckle, lower Simpson, Wilcox (Cambro-Ordovician) and the Cleveland sands and Pawhuska limestone of Pennsylvanian age on the upthrown side of the fault. Pennsylvanian formations running up to about 4,000 ft. in thickness constitute the major part of the section to be cut in Oklahoma City.

The new discoveries just east of the field on the downthrown side of the fault found gas-distillate and oil in basal Pennsylvanian sands. R. W. Hibbert completed the discovery well (C on map) in July in this new highly regarded discovery area just east of Oklahoma City for 96 bbl. of distillate and 35,000 M.c.f. of gas daily from perforations at 6,714-30 ft., opening Southeast Oklahoma City field. Hibbert took the well to 7,480 ft., finding the Wilcox dry before plugging back for completion.

The new Southeast Oklahoma City pool has been extended ½ mile north by Magnolia Petroleum Co. 1 Cauthorn (B on map), which was completed in the basal Pennsylvanian unconformity sand from perforations at 6,735-43 and 6,751-60 ft. Operators took the hole to 6,875 ft. in the Hunton, but with water in that formation, the well was plugged back to 6,795 ft. Calculated open-flow potential is 32,767 M.c.f. of gas daily. Actual flow previously was 8,100 M.c.f. of gas daily through a ½-in. choke with 8 bbl. of 61.7°-gravity distillate per hour.

Northwest of this area in 18-11n-2w, Jay Simmons found oil in the basal Pennsylvanian sands. His 1 Trosper was completed for 240 bbl. of 39°-gravity oil daily from 6,404-22 ft. at approximately the same depth as the Wilcox on the west side of the fault. Simmons is presently drilling a northwest offset to that discovery (A on map).

Studies made by Oklahoma City geologists indicate that all these wells produce under stratigraphic-trap conditions. The new pools opened by Hibbert and Simmons, producing from lenticular basal Pennsylvanian sands, similar to the sands at Witcher pool in Oklahoma County, were discovered by subsurface studies. Evidence of lenticular sand conditions is apparent due to the difference in producing depths of the two pools.

Now that production has been found on the downthrown side of the fault at Oklahoma City in basal Pennsylvanian sands of the unconformity zone, activity can be expected to increase east of the faulted area of the state's big field. The new discoveries have attracted attention to production possibilities of the basal Pennsylvanian sands on the downthrown side of the fault.

John C. McCaslin.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WYOMING . . . Mountain Fuel Supply Co. 1 Trail Unit, NE NE SE 9-13n-100w, Sweetwater County wildcat, flowed 4,260 M.c.f. of gas daily from the basal Blair sand, lower member of the Mesaverde, for the second Mesaverde discovery in southwestern Wyoming in recent weeks.

WEST TEXAS . . . A new Pennsylvanian area for Scurry County was in prospect at The Texas Co. 1 Fuller, 62-5-H&GN, which kicked off when swabbed to flow 67 bbl. of load and new oil in 2 hours, then gaged 325 bbl. of new oil in 17 hours on 26/64-in. choke. Pay was from 7,586-96 ft.

CALIFORNIA . . . Standard Oil Co. of California appeared to be on the verge of a new oil discovery at its wildcat ¾ mile northwest of Bellevue field in Kern County. Drilled into the lower Stevens, the wildcat found oil showings at about 8,800 ft. A second producer was added at the shallow Pliocene sand discovery recently made by Superior Oil Co. at Lost Hills.

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Harry is one of our most genial Vice Presidents, and is also a rabid sports fan. Newspapering, cards and golf.

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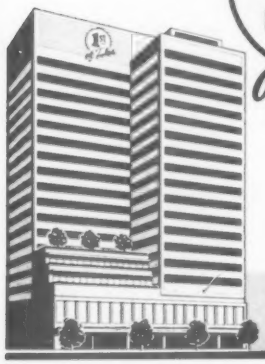

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Southwest Texas

Oil Sands Cored at Duval County Wildcat

CORPUS CHRISTI.—Appell Drilling Co. and George W. Lyles have cored two oil sands at their 2 Lucille Gruy Estate wildcat in Duval County. The Cole and Government sands will make possible oil and the Miranda sand will make gas well. Operator cored Government wells sand 2,475-79 ft. and cored base of Cole sand at 1,835-43 ft., also the Mirando sand was cored from 2,640-72 ft. Drill-stem test was run on section 2,475-79 ft. and on ⅜ by ¼-in. chokes well flowed 20 ft. of oil cut mud with shutin pressure of 500 psi. but test was not of too much value as tool was plugged. Drill-stem test was also run on section 2,665-70 ft. and on ¾-in. chokes well had 400 psi. working pressure in 4 minutes and recovery of 4 ft. of rathole mud and bottom-hole pressure of 645 to 848 psi. Operators plan to test Pettus and Yegua zones before attempting completion. Drill site lies on the M. E. Gussett Survey 394, A-1125.

A new sand has been tested by Western Natural Gas Co. at their 5 Jsefa Gardenas San Salvador outpost in Hidalgo County. Operators have perforated for production at 10,360-410 ft. and is scheduled to be a gas-distillate well. There were several perforations made, 10,698-712 ft., 10,396-400 ft., 9,730-60 ft., 9,180-200 ft., and 8,282-310 ft., but were of no commercial value. Five and one-half-inch production string was run to 12,017 ft. Well is an outpost to San Salvador field. Location is on San Salvador del Tule Grant, Block 156, 7 miles northwest of La Blanca.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Nueces County: Alaska SS Co. & Newman Bros. Drilling Co. 1 Hylton, J. D. Herrera Sur., TD 7,850 ft., IPF open flow 1,450,000 cu. ft. of gas per day.

San Patricio County: Phillips & Renwar Oil Corp. 2 Hogg Est., John Robinson Sur., A-226, TD 8,505 ft., IPF 44.83 bbl. of oil per day on ⅛-in. choke, gas-oil ratio 8,400:1.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Sid Katz 1 D. D. Heinen, Carlos Peréz Sur., dry, TD 1,816 ft.

Martin, Shelly & Thomas and J. R. Hunter Est., 1 R. W. Dossey, Wm. Smith Sur. A-762, dry, TD 1,960 ft.

Texita Oil Co. 2 W. H. Johns, Galba Fuqua Sur., dry, TD 1,708 ft.

Caldwell County: Barron Griffity Oil Co. 1 O. M. Moss, A. Churchill Sur., dry, TD 2,121 ft.

Duval County: Leavitt Corning, Jr. 1 B. O. Hamilton, Ramon Garcia Sec. 6, dry, TD 4,275 ft.

Jake L. Hamon and Edwin L. Cox 1 J. M. Bennett, CEPI&am Sur., dry, TD 5,476 ft.

Panhandle Oil Corp. 1 Leonor G. de Leal, La Huerta Grant, dry, TD 5,000 ft.

LaSalle County: Alaska SS Co. & Newman Bros. Drilling Co. D-5 S. Texas Syndicate, H&GN Sur. 59, dry, TD 4,205 ft.

McMullen County: Anderson-Prichard Oil Corp. 3 Shiner "A," G. J. Goode Sur., dry, TD 1,801 ft.

J. D. Hedly 1 J. D. Campbell, C. B. Dilworth Sur., dry, TD 7,015 ft.

Medina County: George Parker 2 George Parker, John Degant Sur., dry, TD 500 ft.

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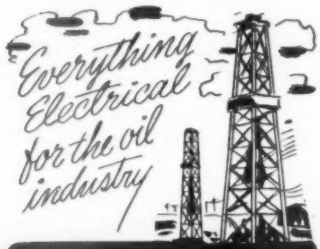

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San Patricio County: Kirkwood & Co. 1 Hogg Est., Thomas Todd Sur., dry, TD 9,000 ft.

Val Verde County: Phillips Petroleum Co. 1 B. E. Wilcox, GC&SF RR Co. Sur., dry, TD 16,445 ft.

Webb County: Calvert, Cochran & Manley 1 J. C. Walker, CCSD&RGNG Sur., dry, TD 1,621 ft.

T. R. Cunningham & R. N. Ranger 1 Hugh Seim, Sur., 502, dry, TD 3,010 ft.

Williamson County: Christie Hewit Est. 1 J. W. Pearson, W. H. Nagill Sur., dry, TD 9,108 ft.

Zapata County: O. W. Killam 1 Lee & Jack Akin, J. V. Borrego Grant, dry, TD 3,430 ft.

California

New Oil Strike Seen In Kern County

LOS ANGELES.—Standard Oil Co. of California appeared to be on the verge of a new oil discovery at its wildcat ¾ mile northwest of Bellevue field in Kern County. Little has been released on the results of numerous formations tests made but they evidently were sufficiently encouraging to cause 7-in. casing to be set at 9,466 ft.

The wildcat, 53 Karpe in SW NE 34-18s-25e, reportedly found the upper Stevens zone fray, a condition which usually has resulted in operators abandoning the wildcat shortly after. Drilled into the lower Stevens, the wildcat encountered oil showings at about 8,800 ft. Following a 1½-hour formation test at 8,790-8,810 ft., about 2,600 ft. of oil reportedly was recovered.

A second producer was added at the shallow Pliocene sand discovery recently made by Superior Oil Co. at Los Hills. The new well, a south offset, was Universal Consolidated Oil Co. 101 well, found the sand higher than did the discovery. It was completed through perforations at 2,723-84 ft., flowing an estimated 130 bbl. of oil daily.

Superior's second well, 2 Lost Hills-Government in 18-36s-21e, was drilled to 4,647 ft. to test deeper possibilities of the new find. Several formation tests made revealed little of promise so that the well, a north offset to the discovery, was plugged back to 3,063 ft. for completion in the Pliocene sand. In addition to this well, Universal Consolidated, Tide Water Associated Oil Co., and General Petroleum Corp. have step-outs under way and Richfield Oil Corp. has staked an extension test in Sec. 11.

CALIFORNIA WILDCAT FAILURES

Fresno County, Coalinga area: Shell Oil Co. 363X 15, 15-19s-15e, dry, TD 10,414 ft., elev. 1,135 ft.

Glenn County, Orland area: Union Oil Co. 44-2 Union - Brazos - Vereschagin, 2-21n-3w, dry, TD 5,022 ft., elev. 224 ft.

Kern County, Edison Groves area: Trico Oil & Gas Co. 1 State Exploration-Portals Comm. 33-29s-29e, Vedder 5,000 ft., Olcese 3,602 ft., dry, deepened from 3,800 ft., new TD 5,050 ft., elev. 611 ft.

Fruitvale area: Sunray Oil Corp. 2 KCL, 26-29s-27e, dry, TD 4,451 ft., elev. 405 ft.

Tejon area: Continental Oil Co. S-1 Conoco-KCL, 1-10n-20w, dry, TD 6,248 ft., elev. 1,225 ft.

Tunis Creek area: Reserve Oil & Gas Co. 36-30 "Well," 30-11n-18w, dry, TD 5,682 ft., elev. 802 ft.

Los Angeles County, Del Valle area: Sea-

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Styles illustrated

527 Jacket 528 Pants 557 Hat

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★ New sectional plate-type compound, the first of its kind. Each engine and compound section can be moved in one unit without danger of engine getting out of line with compound.

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12,000 ft.—3½" Drill Pipe

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WICHITA FALLS, TEXAS

board Oil Co. 1 Seaboard-South Calif. Pet. Corp. Daugherty, 9-4n-17w, dry, TD 6,017 ft., elev. 1,241 ft.

Seal Beach area: Shell Oil Co. 4-1 Bryant, 11-5s-12w, dry, TD 10,992 ft., elev. 25 ft.

Monterey County, King City area: Murdock Oil Co. 1 Marian, 9-20s-8e, dry, deepened from 3,929 ft., new TD 5,306 ft., elev. 400 ft.

Orange County, Anaheim area: D. Frankel 1 Wagner, 23-4s-10w, dry, TD 4,494 ft., elev. 172 ft.

Santa Barbara County, Solvang area: Shell Oil Co. 1 Mitchell, 31-6n-30w, dry, TD 7,520 ft., elev. 775 ft.

Tulare County, Visalia area: King Development Co. 2 A.K., 16-18s-25e, dry, TD 1,757 ft., elev. 351 ft.

Ventura County, Ojai area: Richfield Oil Corp. 67 Ojai, 17-4n-21w, dry, TD 7,492 ft., elev. 1,111 ft.

Simi area: British American Oil Production Co. & Hancock Oil Co. 47-6 Strathern, 6-2n-18w, dry, TD 1,450 ft., elev. 618 ft.

Mississippi

Casing Being Run For Adams Completion

JACKSON.—In Adams County, Mississippi, approximately 2,000 ft. south and slightly east of production in the extreme northeast part of La Grange field, casing is being run for completion attempt at the Serio-Gulmon & Johns 1 Mrs. C. L. Campbell, Section 80-7n-2w. This test was drilled to total depth of 6,510 ft. Log and sidewall cores indicated shows of oil at 6,245-50 ft. A drill-stem test was run using straddle packers to test 6,240-50 ft. On 8-minute test using ¼-in. chokes, top pressure was 1½ psi. Recovery from test was 80 ft. of oil-cut mud, and 55 ft. of clean oil. Shut in bottom-hole pressure was 2,300 psi. This is thought to be in the "Ratcliff" zone of the Wilcox which produces in the wells to the north. From all indications the sand is rather tight, but should be enough to make a commercial well.

In Pearl River County, Mississippi, approximately 5 miles west and slightly north of Pistol Ridge field, the closely watched deep wildcat, Gulf Refining Co. 1 U.S.A. "W," Section 8-1s-14w, is now reported preparing to core at 11,438 ft. after having a slight show in cuttings. In a core from 11,288-291 ft. recovery had been 1½ ft. of light to dark grey sand with faint odor, spotted stain, and spotted fluorescence. Log was run to 11,407 ft. and 30 sidewall cores were attempted from the interval 8,376-11,407 ft. Only 9 were recovered with shows being noted at 9,475 ft., and 10,396-40-41-42 ft. As far as is known, none of the several shows encountered in this well is thought to be commercial.

In The Maxie field area, Forrest County, Mississippi, the Ohio Oil Co. 1 Coleman-Powe A/C 2, Section 32-1n-12w, located approximately ¾ mile northwest of the discovery well, is reported preparing to core for the lower Tuscaloosa at 8,230 ft. No cores have been cut during the past week. It will be recalled that approximately 20 net feet of gas sand was cored in the Eutaw-upper Tuscaloosa zone.

MISSISSIPPI WILDCAT FAILURES

Adams County: John S. Callon 1 Nathan McGee, 19-6n-1w, dry, TD 6,504 ft.

Washington County: W. C. Feazel-Monla Gas Co. 1 Q. N. Quinn, 18-15n-8w, dry, TD 3,602 ft.

Wayne County: The California Co. 1 J. D. Perryman, et al, 5-6n-6w, dry, TD 7,926 ft.

ALABAMA WILDCAT FAILURE

Washington County: S. P. Borden, et al, 1 Knowlton & Smithers, 12-2n-3w, dry, TD 7,271 ft

Louisiana-Ark.

Wildcat Tests Oil and Water in Rapides

SHREVEPORT.—Carter Oil Co. tested water with slight shows through first production perforations at 1 South Catahoula Lake in 32-6n-3e, northeastern Rapides Parish. Scattered sands with shows of oil were recovered on a core from 4,312-59 ft. Recovery on a 20-minute drill-stem test of the interval 4,335-38 ft., with ¼-in. chokes used, recovered 240 ft. of clean oil, 220 ft. oil and salt water and 240 ft. of salt water.

Hunt Oil Co. has confirmed pay in Big Bayou field, Catahoula Parish. The 72 Louisiana Delta Hardwood Lumber Co., southwest diagonal offset to the discovery well, flowed 85-90 bbl. of oil daily through 8/64-in. choke from perforations in Wilcox sand at 5,160-62 ft. The first confirmation try failed, the 71 Louisiana Delta Hardwood Lumber Co., northeast diagonal offset to the discovery.

H. L. Hunt et al are drilling ahead below 4,580 ft. in sand and shale after missing the pay zone of the discovery well in West Pool Lake field, Catahoula Parish. No shows were found in a core from 4,530-80 ft. at

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these Debentures. The offer is made only by the Prospectus.

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(an Indiana corporation)

Thirty Year 3⅛% Debentures

Dated October 1, 1952 *Due October 1, 1982*

Convertible on or prior to October 1, 1962

Rights, evidenced by subscription warrants, to subscribe for these Debentures have been issued by the Company to its capital stockholders, which rights will expire at 2:30 P.M. Central Standard Time on October 6, 1952, as more fully set forth in the Prospectus. The Company is also receiving subscriptions from certain of its officers and employees during the subscription period for not in excess of $4,000,000 aggregate principal amount of Debentures not purchased by warrant holders, as more fully set forth in the Prospectus.

Subscription Price 100%

During and after the expiration of the subscription period, the several underwriters may offer Debentures at prices which will not be below the Subscription Price set forth above (less, in the case of sales to dealers, the concession allowed to dealers) and not more than the greater of the following prices (i) the highest price at which the Debentures are being offered in the over-the-counter market, or (ii) the greater of the last sale or current offering price of the Debentures on the New York Stock Exchange, plus in either case accrued interest and an amount equal to any dealer's concession.

Copies of the Prospectus may be obtained from only such of the undersigned as may legally offer these Debentures in compliance with the securities laws of the respective States.

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DREXEL & CO. *EASTMAN, DILLON & CO.* *KIDDER, PEABODY & CO.*

LAZARD FRERES & CO. *MERRILL LYNCH, PIERCE, FENNER & BEANE*

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September 18, 1952.

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WRITE FOR BULLETIN NO. 112 OG

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HACKSAWS, BAND SAWS and BAND KNIVES

E-19 Fisher Lumber Co., C SW SW 16-8n-7e, east offset to the discovery well. The well will be taken to 6,000 ft. seeking production.

Arkansas.—Carter Oil Co. has two possible pays at their Union County wildcat, 1 E. M. Wooley, NE NE 28-18s-17w, 1 mile southeast of Schuler field and 3 miles north of Three Creeks town. A 1-hour drill-stem test in Tuscaloosa from 3,099-3,120 ft. recovered 330 ft. of oil, 75 ft. of oil-cut mud and 75 ft. of salt water. Carter then drilled to 4,204 ft., finding oil shows from samples from 3,214-20 ft. in the Lower Cretaceous. Hole was cased to 3,365 ft. for completion trials.

McAlester Fuel Co. will make first production tests in the Smackover at 1-A J. B. and T. D. Burton, C NE SW NE 36-17s-25w, Lafayette County wildcat. Cores and drill-stem test indicated possible production from Cotton Valleys sands and from porosities in the Smackover lime. Production string is at total depth 9,486 ft.

LOUISIANA WILDCAT FAILURES

Concordia Parish: Barnett Serio et al 1 Learned-Peabody, 17-8n-10e, dry, TD 7,010 ft.

Justiss-Mears Oil Co. 1 McGee Evans, C NW SW 39-6n-9e, dry, TD 7,012 ft.

Hunt Oil Co. and Gulf Refining Co. 9 Metropolitan Museum of Arts, 2,156 ft. N and 294 ft. E of SWc 48-3n-7e, dry, TD 7,212 ft.

ARKANSAS WILDCAT FAILURES

Hempstead County: Austin E. Stewart et al 1 Graves, C NW SE SE 16-13s-24w, dry, TD 4,609 ft.

Nevada County: Ranney Exploration Co. 1 Silvey, 150 ft. N and E of C NE SE 15-14s-22w, dry, TD 3,814 ft.

Union County: Blackwell Oil & Gas Co. 1 Thurman, 330 ft. N and E SWc E½ W½ 4-20s-15w, dry, TD 8,795 ft.

Texas Gulf Coast

Gas Recovered at Hallettsville Extension

HOUSTON.—Kirkwood & Co. and Alex W. Head's 1 Joseph Bladau, extension to Hallettsville field in Lavaca County, has recovered 1,046,950 cu. ft. of gas from tests on open hole and 676,000 cu. ft. through perforations at 7,750-60 ft. Previous production for the field was indicated at 8,450-56 ft. in the Wilcox. Hole is bottomed at 8,930 ft. with 5½-in. production string cemented at 8,250 ft. Test perforations shot at 7,763-67 ft., on a 9-hour test, flowed gas-distillate and well developed 1,000 psi. working pressure. Another interval perforated at 8,192-99 ft. flowed gas and distillate under working pressure of 1,725 psi. with 1,080 ft. of water cushion. Operators were waiting on potential. Location is on the Luke J. Presnall Survey, A-335.

Southern Minerals Corp. of Corpus Christi, has cemented 7-in. casing in 1 W. Roy Wright after recovery of oil on 2 drill-stem tests taken on a 13-ft. sand section, 8 miles west of Garwood and 2¼ miles north of North Garwood field, Colorado County. The apparent oil discovery showed recovery of 3,130 ft. of pipe line oil and 150 ft. of oil-cut mud on last test at 8,995-9,005 ft. with tool open 20 minutes. Test developed 5 psi. working pressure at the surface with 1,000 ft. of water cushion, and ⅜ by ¼-in. chokes. Bottom-hole flowing pressure registered 1,100 psi., shut-in pressure 3,950 psi. Hole is bottomed at 9,005 ft. with 7-in. cemented to 8,905 ft., after running survey to 8,905 ft. First test on interval 8,982-95 ft., ⅜-in. chokes, 1,000 ft. water cushion, developed 14 psi. working pressure, recovered 1,380 ft. of pipe line oil, bottom-hole flowing pressure 925 psi. and 3,875 psi. shut-in pressure. Location is on the J. G. Mahon Survey 12, A-747.

Near the San Jacinto Battlegrounds, Harris County, N. B. Hunt has reported official potential on 1 Leon H. Curtin, gas-distillate discovery in the Frio zone through perforations 5,452-62 ft. Absolute open flow potential showed the well to be good for 40,000,000 cu. ft. of gas per day with flow of 50.2°-gravity distillate registering gas-liquid ratio of 336,700:1. Shut-in well head pressure is 2,151 psi., absolute. Flow on 9/64-in. choke was gaged for 6,750,000 cu. ft. Hole is bottomed at 8,350 ft. and plugged back at undisclosed depth, 5½-in. cemented at 5,471 ft. and 2⅞-in. tubing swung at 5,451 ft. The new gas reservoir is 2½ miles southwest of Lynchburg, with location on the George Ross Survey, A-646.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Hardin County: New pay at South Hampton-Kirby Petroleum Co. 1 J. E. Wheat et al, Fountain Simmons Sur., TD 8,515 ft., perf. Yegua 7,650-53 ft., IP 121 bbl. oil per day, 14/64-in. choke 36° gravity, TP 215 psi.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Bee County: Henshaw Bros. & O. R. Mitchell 1 Otto Johnson, W. A. Butsill Sur., dry, TD 6,325 ft.

Stanolind Oil & Gas Co. 1 Imogene Hall, Thomas B. Barton Sur., dry, TD 8,720 ft.

Colorado County: Warren Pet. Corp. 2 Joe J. Hanak, W. K. Paulding Sur., dry, TD 3,550 ft.

Ft. Bend County: Jack W. Frazier & Humble

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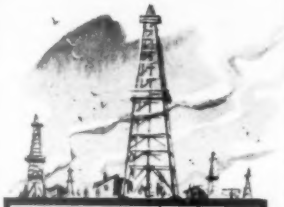

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Oil & Refining Co. 1 Wilson G. Wing, Benjamin Osbourn Sur., dry, TD 8,172 ft.

Jackson County: Del Ray Pet. Co. 1 Frank Vincek et ux, Valentine Garcia Sur., A-24, dry, TD 7,450 ft.

Hardin County: Houston Oil Co. and American Republics Corp. 1 G. W. Simpson et al, Andrew Hay Sur., A-264, dry, TD 10,002 ft.

Karnes County: T. C. Huddle et al 1 Mrs. G. Wright, F. Anthony Sur., dry, TD 4,205 ft.

Jefferson County: F. A. Callery, Inc. 1 J. E. Broussard et al, B. A. Vacocu Sur., dry, TD 11,933 ft.

Lee County: B. W. Foss 1 L. E. Sanders, J. Von Roeder Sur., dry, TD 2,300 ft.

Matagorda County: Tennessee Production Co. 1 Pierce Est.-Rawls & O. H. Stout Sur. A-82, dry, TD 7,655 ft.

Refugio County: F. Wm. Carr 1 J. A. Hynes, Refugio Town Tract, dry, TD 8,507 ft.

857 M.c.f. of gas from Morrow 6,495-6,540 ft., TD 6,704 ft.

Jackson County: Mid-Continent Petroleum Corp. 1 Sue Richardson, SE SW SE 30-1n-19w, pumped 38 bbl. of oil from 2,396-2,407 ft., TD 2,702 ft.

Lincoln County: R. M. Jordan 1 Lopez, NW NW SW 6-14n-2e, flowed 30 bbl. of oil from upper Cleveland sand 3,940-60 ft., TD 5,479 ft.

OKLAHOMA WILDCAT FAILURES

Beaver County: Youngblood 1 Bar-by, C NW NW 28-6n-26ecm, dry, TD 6,708 ft.

Garvin County: O. E. Dempsey 1 Burch, SE SE NW 10-3n-1w, dry, TD 5,672 ft.

Grant County: Beach & Talbot 1 Smith, E½ Nw NW 15-28n-3w, dry, TD 5,119 ft.

Kay County: Helmerich & Payne, Inc. 1 Lashbrook, SE SE SW 28-29n-3e, dry, TD 3,323 ft.

Noble County: T. N. Berry Co. 1 Wyatt, NW NW SE 3-20n-2w, dry, TD 5,436 ft.

Oklahoma County: G. L. Reasor 1 State, NW NW SE 36-12n-1e, dry, TD 6,217 ft.

Payne County: V. E. Martgan 1 Goom, NE NE NE 30-19n-3e, dry, TD 4,573 ft.

Warren-Bradshaw Exploration Co. 1 John Harris, SE SE SE 31-20n-3e, dry, TD 4,623 ft.

Pontotoc County: J. M. King 1 Floyd, SW SW SW 15-4n-4e, dry, TD 1,705 ft.

Pottawatomie County: Ryan Oil Co. 1 State, SW NW NW 36-8n-2e, dry, TD 5,650 ft.

Stephens County: Carter Oil Co. et al 1 Harrell, NE SE SW 12-1n-4w, dry, TD 8,480 ft.

Texas County: Westhoma Oil Co. 1 Goosen, SW SW NE 34-4n-18ecm, dry, TD 6,910 ft.

Tillman County: Dumm Bros. Oil Co. 1

Oklahoma

Garvin County Wildcat Makes Good Producer

SHELL OIL CO. has completed a good discovery well in southwestern Garvin County at its 1 G. L. Rose, SE NE SW 6-1n-3w. The well, more than a mile northwest of the old, shallow Robberson field, flowed 288 bbl. of oil in 24 hours through ¾-in. choke. Gas-oil ratio during the completion gage was 360 cu. ft. per barrel. Gravity of the oil was 30°. On pre-completion gages, flow was gaged at rates up to more than 161½ bbl. per hour.

Production is from a Pennsylvanian sand, opposite which casing is perforated at 3,647-57 ft. and 3,661-83 ft. Operators originally planned to carry the hole to a depth objective around 8,000 ft. and drilled to 4,973 ft. before deciding to run casing and complete in the relatively shallow sand. Casing was run to 3,818 ft. Drilling already is under way at 2 Rose, a location southeast of the discovery.

Arrow Drilling Co.'s new discovery well, 1 Patterson, in the NW SE NW 30-22n-1e, 6 miles northeast of Perry, in Noble County, also is in process of completion. Pumping equipment has been installed to actuate production. Previously, the well flowed 131 bbl. of oil in 10 hours through 10/64-in. choke. Initially, it made 32 bbl. of oil per hour through ½-in. choke. Pay is in a porous Mississipian zone, open at 4,761-75 ft.

A new Sycamore (Mississippian) producing area is being opened on the northwest flank of Milroy development in Stephens County. The discovery well, Edwin L. Cox, NE NE NW 15-2s-4w, came in flowing at the rate of 7 bbl. of oil per hour through ¼-in. choke after a zone-fracturing treatment. Pay is at 4,136-75 ft. (casing perforations) in hole drilled at 4,180 ft. Nearest previous Sycamore production is 5 miles to the southeast in the Fox-Graham field.

Discovery of a new Wilcox pool, located 2 miles southwest of Tecumseh, Pottawatomie County, is indicated by showings encountered by Richard Rheem and associates in their 1 Prater, NW SE SW 23-9n-3e. A 2-hour drill-stem test at 5,296-5,322 ft. in the first Wilcox sand recovered 630 ft. of oil with a small amount of water. A previous 2-hour test in the Wilcox dolomite at 5,252-72 ft. got 90 ft. of oil and 180 ft. of mud-cut oil. Hole is being deepened to the second Wilcox.

OKLAHOMA SUCCESSFUL WILDCATS

Beaver County: Sinclair Oil & Gas Co. 1 Maple, C SW NE 26-5n-24ecm, flowed

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See Composite Catalog . . . For more detailed information on Red Devil Products, see the Composite Catalog or write for special price on page noted above. Red Devil products are available through your supply house.

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D. H. Bolin 1 Palmer, NW NW NE 31-2s-18w, dry, TD 3,735 ft.

North-Central Texas

New Pay Established In East Bryson Field

WICHITA FALLS.—New pay, in the Bend conglomerate, has been established in East Bryson field of Jack County at J. B. Hewitt 1 W. J. Chambers, 1 mile east of the town of Bryson.

On production test, the new well flowed 300 bbl. of 45°-gravity oil in 3 hours through ½-in. choke, from perforations between 4,499-4,560 ft. Regular field pay ranges from 2,950-3,325 ft.

New work for Jack County included M. E. Andrews, Ltd. et al 1-A W. Ruth Richards, scheduled 5,500-ft. wildcat 7 miles southeast of Jacksboro in the A. B. Henson Survey, and Russell Maguire 1 Ferguson, 5,200-ft. test 5 miles northwest of Perrin in Section 2,729, TE&L Survey. Warren Petroleum Corp. also plans to drill 1 G. L. Jones to 5,000 ft., 3 miles north of Bryson in the E. O. Allbritton Survey.

Mid-Continent Petroleum Corp. 1 Loyd Orrell, Montague County deep wildcat 2 miles northwest of Forestburg, was drilling ahead below 7,688 ft. Last reported drill-stem test was from 6,988-98 ft., which developed 900 ft. of gas in the pipe and 115 ft. of oil and gas-cut mud. Top on the Marble Falls limestone was 6,833 ft.

In Throckmorton County Andrew M. Howsley 1 J. B. Herrington, Section 903, TE&L Survey, has been completed as a Bend conglomerate discovery. The well flowed 311 bbl. of oil a day through ¼-in. choke from perforations as 4,436-42 ft. Location is 3½ miles southwest of Woodson. The well was an old well drilled deeper, having been originally completed as Dr. R. Graham Cherry 1 Herrington, a Caddo limestone discovery.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Brown County: N. M. Dillard 1 J. L. Byrd, Sec. 148, W. B. Travis Sur., TD 1,371 ft., pay 1,334 ft., IP pumped 45 bbl. 44°-gravity oil.

Coleman County: Miami Operating Co. 2 Clyde Parker, 26-4-T&NO, TD 3,849 ft., elev. 2,012 ft., pay 3,740 ft., IP pumped 66 bbl. 43°-gravity oil.

Montague County: W. T. Waggoner 1 J. F. Clark, Watts Sur., 1 mile NE Montague, TD, 6,559 ft., elev. 1,063 ft., conglomerate pay 6,280 ft., IP 375 bbl. 40°-gravity oil, 10/64-in. choke, TP 600 psi., GOR 500 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Consolidated Oil Co. 1 Burk Warmuth, Blk. 3, Clark & Plumb, dry, TD 4,733 ft.

J. S. Jackson 1 J. C. Jones, I. Kornicky Sur., A-245, dry, TD 1,738 ft.

Joe Reznick 1 Frank Jehlik, Blk. 131, Harris Subd., dry, TD 3,912 ft., Strawn 3,716 ft.

Baylor County: E. B. Clark 1 W. T. Wallace, Blk. 191, T&NO, dry, TD 5,353 ft., Caddo 5,358 ft.

Callahan County: McElroy Ranch Co. 2 Fae Wilbanks, J. H. Johnson Pre-Emp Sur., dry, TD 3,440 ft., elev. 1,418 ft., Caddo 3,306 ft.

Clay County: Grace & Grace 1 Claude McAdams, Blk. 2, Graves Subd., Orange CSL, dry, TD 6,515 ft., Caddo 5,800 ft.

S. D. Johnson 1 N. T. Gains, Henry Dixon Sur., A-106, dry, TD 6,593 ft., Ellenburger 6,500 ft.

H. R. Wilson 2 Stine, Blk. 64 & 65, Bacon Subd., dry, TD 212 ft.

Cooke County: R. R. Kyner 1 R. C. Looke, H. Nail Sur., A-790, dry, TD 1,500 ft.

W. P. Luse 1 H. H. Roberts, J. B. Botaid Sur., A-75, dry, TD 3,738 ft.

David H. Rankin 1 John Hacker, J. Garner Sur., A-392, dry, TD 1,400 ft.

John Wilson 1 Joseph Fischer, Blk. 11, John Barnett Sur., A-42, dry, TD 2,055 ft.

Eastland County: D. W. Henke 1 J. W. Brown, 118-3-H&TC, dry, TD 3,162 ft.

Haskell County: Geochemical Surveys 1 S. N. Reed, 25-14-H&TC, dry, TD 5,660 ft., elev. 1,551 ft., Caddo 5,600 ft.

Belcher & Harding 1 L. Fagan, 2-2-T&NO, dry, TD 2,404 ft., elev. 1,726 ft., Sedwick lime 1,450 ft.

Jack County: F. Kirk Johnson 1 J. H. Erwin, J. W. Bates Sur., A-47, dry, TD 4,793 ft., conglomerate 4,421 ft.

S. D. Johnson 1 J. H. Bowen, R. Barker Sur., A-461, dry, TD 4,172 ft.

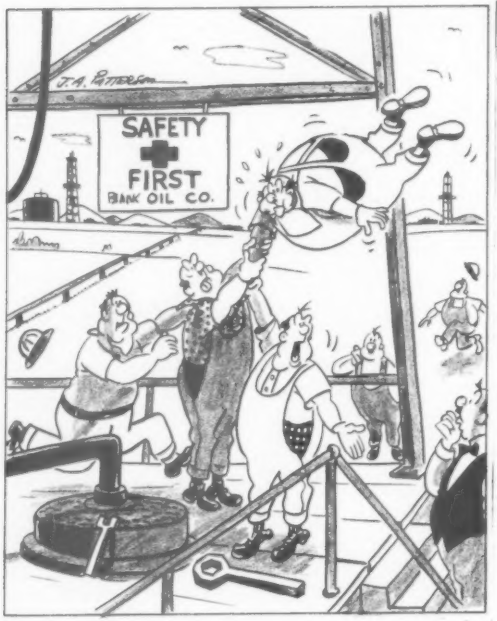
Perkins & Cullum 2 A. A. Kinder, WCRR Sur., A-907, dry, TD 4,728 ft.

W. C. Young 1 John Pursley, J. R. Small Sur., dry, TD 3,340 ft.

Jones County: A. P. Carr 1 Ora Douthit, Sec. 24, HT&B, dry, TD 1,780 ft.

Ernest Fletcher 1 R. F. Ratliff, Sec. 44, OAL Sur., dry, TD 3,040 ft., elev. 1,712 ft., Swastika 2,409 ft., reef 3,030 ft.

Grisham-Hunter Corp. 1 C. G. Burson,



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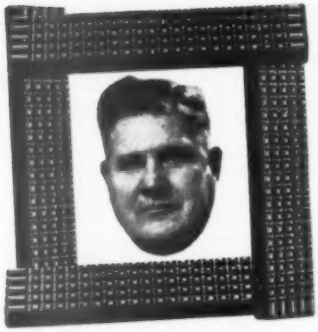

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Sec. 6, Lgc. 338, Austin & Williams Sur., dry, TD 3,240 ft., elev. 1,679 ft., King, 3,061 ft., Gunsight 3,131 ft., Swastika 3,210 ft.

J. C. Jackson 1 Hestand, Sec. MEPRR, dry, TD 4,719 ft., elev. 1,793 ft., Hope 2,640 ft., reef 4,275 ft.

Jones & Stasney 1 Guy Poe, 2-358-Goliad CSL, dry, TD 3,365 ft. elev. 1,816 ft., Flippen 2,865 ft.

Texas Pacific Coal & Oil Co. 1-A Huddleston, Sec. 210, J. W. B. McFarland Sur., dry, TD 5,645 ft., Caddo 5,268 ft., Ellenburger 5,364 ft.

Knox County: Jones, Anderson & Word 1 H. Kempner, 61-13-H&TC, dry, TD 5,808 ft.

Oil Associates, Inc. 1 Myrtle White, 51-2-D&W, dry, TD 2,391 ft.

Montague County: George S. Engle 1 Mrs. Ruby Pierce, Blk. 102, Panola CSL, dry, TD 7,000 ft.

Luke Grace 1 Mrs. M. Mitchell, 87-5-Chas. Lockhart Sur., dry, TD 5,812 ft.

Palo Pinto County: Trumter Petroleum Corp. 2 W. E. Brannon, L. A. Bradley Sur., dry, TD 1,495 ft.

Parker County: Kerentex Oil Co. 1 H. C. Schrieber, G. W. Stell Sur., dry, TD 4,500 ft., elev. 863 ft., Caddo 2,507 ft., Mississippian 4,312 ft.

Shackelford County: John E. Carter 1-A Green, 49-12-T&P, dry, TD 1,225 ft.

Stephens County: Allan T. Strong 1-B Ford, 410-1,063-TE&L, dry, TD 4,264 ft., elev. 1,187 ft., Caddo 3,308 ft.

Stonewall County: Continental Oil Co. 1 B. Brown Smith, 414-D-H&TC, dry, TD 6,940 ft., Mississippian 6,215 ft., Ellenburger 6,886 ft.

Taylor County: West Central Drilling Co. et al 1 F. L. Groves, Sec. 62, McCloud Sur., dry, TD 2,945 ft.

Throckmorton County: Arkansas Fuel Co. 1 C. C. Rogers, Sec. 2,154, TE&L Sur., dry, TD 4,608 ft.

Young County: Joe K. Bailey 1 Susan Sallie, Susan Sallie Sur., A-252, dry, TD 3,700 ft.

W. F. Bockhoff Trustee 1 J. E. Boley, Blk. 194, TE&L, dry, TD 1,137 ft.

Eastern Texas

Second Woodbine Sand Indicated in East Texas

DALLAS.—Reports from East Texas indicate the possibility of a second Woodbine sand having 20-30 ft. of oil pay underlying the original sand zone of East Texas oil field.

Deepening operations in the Rusk County portion of the field have found this new sand strata beneath a shale break ranging from 65-150 ft. below the water table in the regular producing zone, it was said. In reworking the wells, operators drill through the upper Woodbine, squeeze off the water with cement and cut through the shale break into the new sand zone. According to reports, several wells in the Pru, Cordova, Cadena and Daniel Clark surveys have been drilled ahead to the new sand.

Stanolind Oil & Gas Co. has announced plans for a sub-Clarksville test ½ mile southeast of present production limits of Quitman field of Wood County. Location was reported to be in the John Allen Survey, 2 miles north of Quitman. Majority of the field's sub-Clarksville producers are in the northeast portion of the field.

General American Oil Co. 1 Gunter, wild-

Magnaglo indications of corrosion—fatigue cracks inside drill pipe.

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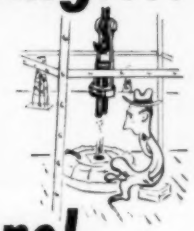
Going!...



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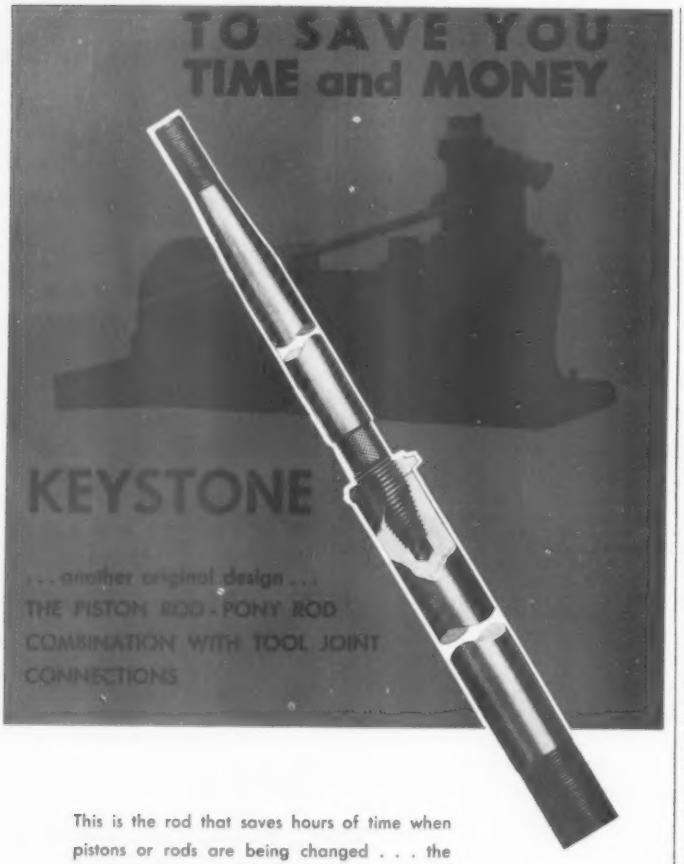

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cat 3 miles north of Quitman, reported a show of oil in the Paluxy, but found water on drill-stem test around 6,250 ft. Details had not been released.

Rowan Oil Co. 1 B. L. Markum, Tarrant County wildcat northwest of Benbrook, had gas on drill-stem test at 5,604-34 ft. A 3-hour test at that interval recovered 4,500 ft. of gas in drill pipe, plus 25 ft. of gas-cut mud. It was drilling ahead in hard sand at 5,716 ft.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Kaufman County: T. D. Humphrey 1 R. F. Kenower, J. K. Taylor Sur., ½ mile N Prairieville, dry, TD 4,214 ft.

Robertson County: Johnny Mitchell 1 B. W. Cain, John Fisher Sur., 3 miles N Calvert, dry, TD 3,097 ft.

Appalachian-Ohio

Fifth Sand Gas Well Finaled in Roaring Creek

PITTSBURGH.—In Roaring Creek district, Randolph County, West Virginia, Nollem Oil & Gas Corp. completed 2 Goff Arnold Land Co., elevation 2,736 ft., gaging 66,000 cu. ft. of gas in the Fifth sand, after shot. It was drilled to a depth of 4,607 ft., and plugged back to 2,435 ft.

Maryland.—Garrett County, Maryland: Eagle Oil & Gas Co. completed 1 John Loher, gaging 23,000 cu. ft. of gas at 3,166 ft. The Oriskany sand was at 3,269 ft., TD 3,332 ft. Eberly & Snee 1 Ross Lichty completed fishing and is now drilling at 817 ft., Columbian Carbon Co. 1 D. Milton Riley, 2,160 ft.; Cumberland & Allegheny Gas Co. 1 Noah Shrock, 4,570 ft.; W. H. and A. A. Rader 1 Pleasant Valley Church 3,240 ft., and Superior Oil Development Co. 1 Wilt & Jacobs at 4,565 ft.

Pennsylvania. — Unity Township, Westmoreland County, Southwest Pennsylvania: Peoples Natural Gas Co. 4003, A. J. Dotterway ran 7-in. casing at 8,261 ft., and is waiting for cement to set. No. 4008 J. R. Frola, is drilling at 5,750 ft.

WEST VIRGINIA SUCCESSFUL WILDCAT

Randolph County: Roaring Creek district, Nollem Oil & Gas Corp. 2 Goff Arnold Land Co., elev. 2,736 ft. 66,000 cu. ft., Fifth sand, TD 4,607 ft.

MARYLAND SUCCESSFUL WILDCAT

Garrett County: Eagle Oil & Gas Co. 1 John Loher, 23,000 cu. ft. gas, at 3,166 ft., Oriskany sand 3,269 ft., TD 3,332 ft.

OHIO

Mount Zion pool in Jackson Township, Knox County, is being extended northwest, west and south. Ulmer and Keithlay 1 Clarence Ashcraft, Section 17, has a fair show of oil in the Clinton, logged at 2,900-37 ft. which will be shot; Wray Drilling Co. 1 Walter Hess, Section 17, filled 2,000 ft. with oil while drilling in; and Mutual Oil & Gas 1 Wheeler Johnson, Section 24, is reported to have a very good showing of oil. In Bladensburg pool in the same township, Mutual 1 Andrew Reni, Section 6, gaged 360,000 cu. ft. natural, and shut in at an estimated 1,000,000 cu. ft. after shot. Clinton sand was logged at 2,734-62 ft.

Permian Basin

Upton Devonian Strike Reports Thick Pay Section

MIDLAND.—Gulf Oil Corp. 1 McElroy-State, west-central Upton County Devonian discovery, had a total indicated pay section of 244 ft., based on drill-stem test recoveries. The well was started as an Ellenburger test and was to be drilled deeper.

Last-reported test in the Devonian was a 3½-hour period from 10,544-94 ft., which had gas in 4 minutes and mud-cut oil in 20 minutes. It was cleaned into pits for 5 minutes, then turned into tanks where it gaged 114 bbl. of 45°-gravity oil in 3 hours. Recovery in the stem was oil and mud, with no shows of formation water.

Previous tests were: From 10,350-79 ft. the well flowed 27.6 bbl. of oil in 3 hours; recovery at 10,370-411 ft. was gas-cut mud, then additional pay was found between 10,500-44 ft. when the well flowed 144 bbl. of oil in 4 hours.

Location of the strike in NE SW 182-CCSD&RGNG is about 5 miles west of Wilshire-Ellenburger field, and 1 mile east of the shallow McElroy area.

A north extension to Ellenburger production was in prospect at Continental Oil Co. 1-D Shannon, Section 20. Drill-stem test at 7,360-7,435 ft. had gas in 5 minutes and oil in 31 minutes, then flowed 40 bbl. of clean oil in 45 minutes. Between 7,420-75 ft. recovery was salt water with no oil. Operators ran electrical surveys and set casing for completion.

Continental's other wildcats in the area were drilling ahead. These included 1-B Harris, 17-HH-GC&SF, below 8,147 ft. in shale and lime; 1 Friend, J. McClelland Survey 28¼, below 7,045 ft. in shale, and 1-C Harris, 4-BB2-F. Boren Survey, in shale at 7,051 ft.

In Coke County, Kenneth Rich and others 1 Moore has extended Strawn sand production ½-mile west and slightly north of nearest producers in Jameson field. Daily potential was 63.5 bbl. of 45°-gravity oil, through ⅛-in. choke from perforations between 5,846-5,992 ft. Top of pay was 5,846 ft. on elevation of 2,023 ft.

Marlowe 1 Copeland, Coke County wildcat, swabbed 32 bbl. of oil and 47 bbl. of water in 12 hours from Ellenburger perforations at 6,420-40 ft. Another section was perforated between 6,445-49 ft. for additional tests. Top of the formation was 6,420 ft. on elevation of 2,145 ft.

In Ector County Phillips Petroleum Co. 1-B Millard, west offset to a recent northwest extension well to the Penwell-Ellenburger field, developed flowing oil on a drill-stem test in the Ellenburger at 8,650-77 ft. Oil reached the top in 40 minutes and after flowing to pits, gaged 24.8 bbl. of 42°-gravity oil in 1 hour.

On the northwest side of Pegasus field, Magnolia Petroleum Co. 3-A John Windham completed as another link well between the two areas. Daily flowing potential was 589 bbl. of 53°-gravity oil, flowing through ¼-in. choke from open hole below casing at 12,723 ft. to 13,122 ft., total depth. Top of pay was 12,724 ft. on derrick-floor elevation of 2,881 ft.

In Weiner-Floyd Spraberry field, Reagan County, Warren Oil Corp. had east and west extension wells. Warren 2 Proctor, on the west side, completed for a daily flowing potential of 753 bbl. of 42°-gravity oil, through ½-in. choke from open-hole pay between 7,516-94 ft., total depth. Warren 1 Proctor, east extension, flowed 420 bbl. of oil a day through ½-in. choke, from pay between 7,540-73 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Irion County: Humble Oil & Refining Co. 2-B Williams, Sec. 1,155½, L. B. Cooke Sur., TD 7,405 ft., elev. estimated 2,549 ft., pay 6,450 ft., IP pumped 20 bbl. 38°-gravity oil.

Runnels County: T. D. Humphrey 1 D. O. Lee, Joe Farwell Sur. 313, TD 5,116 ft., pay 5,109 ft., IP 165 bbl. 41°-gravity oil, 11/64-in. choke, TP 425 psi.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Dawson County: Fred W. Shield 1 W. F. Galbraith, 77-M-GL&RR, dry, TD 8,610 ft., elev. 3,071 ft., Spraberry 7,500 ft., (?) reef 8,597 ft.

Glasscock County: Phillips Petroleum Co. 2 Woolsey, 26-36-T2S-T&P, dry, TD 245 ft. Fred Turner Jr. 1 S. C. Currie, 4-32-T5S-T&P, dry, TD 6,233 ft., elev. 2,567 ft., Clear Fork 2,730 ft.

Martin County: DeKalb Agricultural Association 1 Kitta Belle Knox, Lge. 253, Ward CSL, dry, TD 12,646 ft., elev. 2,884 ft., Spraberry 7,855 ft., Woodford 11,864 ft., Montoya 12,320 ft., Ellenburger 12,450 ft.

Reagan County: Brooks & Turner & Blankenship 1 Sugg, 41-A-TCRR, dry, TD 2,260 ft., San Andres 1,920 ft.

Runnels County: DeSoto Oil Co. 1 Carl Tegel, H. A. Thompson Sur. 530, dry, TD 4,330 ft.

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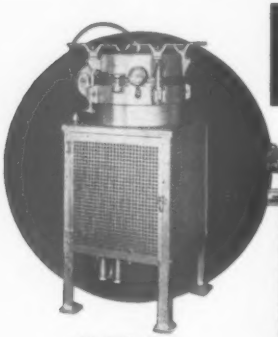

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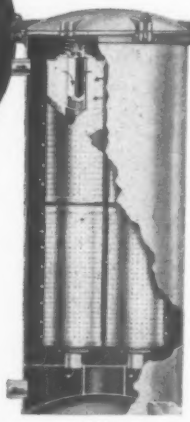

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Upton County: Gustav Ring 1 E. F. Noelke, 14-B2-GC&SF, dry, TD 8,500 ft., Wolfcamp 5,000 ft., Devonian 7,770 ft., Montoya 8,220 ft.

TEXAS PANHANDLE

Gulf Oil Corp. is proving a new rich and deeper zone in Quinduno field, recently opened pool about 8 miles west of Miami, Roberts County. The new zone discovery is 1 John Haggard, 660 ft. from south and west lines, Section 5, Block 2, I&GN Survey, about 60 miles northwest of nearest comparable production in Mayfield pool, Beckham County, Oklahoma. From perforations 7,250-60 ft. after being swabbed to pits, the well flowed 236 bbl. of 73.5°-gravity distillate, some salt water, and 11,458 M.c.f. of gas daily through open tubing. The zone is one of several found in the Pennsylvanian granite wash. The new zone strike is ¾ mile west of Gulf 2 Haggard, earlier Brown dolomite

(Continued on page 366)

Canadian Fields

Heavy Oil Strike Seen At Saskatchewan Driller

CALGARY.—Red Creek Oil & Gas, Ltd., of Calgary has indicated discovery of heavy oil at its wildcat driller in the Arelee area of central Saskatchewan. This venture found oil saturated cores in six zones of the Lower Cretaceous, and encountered some oil encouragement in the Devonian.

The indicated oil strike came at Sohio-Red Creek 5 Arelee, on LSD 13, 11-40-12w3, the company's fifth driller in that general area of Saskatchewan. Drill-stem tests at the well did not give up any free oil, but company engineers believe that the extent of the oil-saturated formation in the Cretaceous would make commercial production possible.

Arelee No. 5 found six well defined saturated zones in the Cretaceous, which ranged in thickness from 6 in. to 15 ft. The 15-ft. section was between 1,950-65 ft., while a 5-ft. zone showed up between 2,150-60 ft. Smaller oil saturated zones came in between 1,965-2,150 ft.

Upon deepening crew found oil encouragement in two Devonian zones. Cores showed oil limestone fractures from 2,365-70 ft. and 2,336-50 ft. Drill-stem tests in this formation also failed to give up any free oil recovery, and it is doubtful whether the showing obtained would yield in commercial volume. However it is significant, as it is the first oil encouragement to be found in the Devonian, in this general region of Saskatchewan.

Arelee No. 5 well is now bottomed in the Devonian at 2,362 ft., and testing is being continued. Hole will be deepened in the Devonian, and operators state that it may go down to the Silurian formation. This indicated discovery well is located about 35 miles southeast of North Battleford and 45 miles northwest of Saskatoon.

The Fiveland wet gas and oil discovery well has been completed and crew is moving off rig after indicating an initial potential of 1,058 bbl. daily during a lengthy flow test on restricted choke. The well, Gulf-CPR 4 Fiveland, on LSD 4, 3-46-28w4, is 25 miles west of Wetaskiwin, in central Alberta.

Fiveland No. 4 contacted D3 Devonian reef at 6,852 ft., or 3,908 ft. subsea, and encountered 491 ft. of pay zone prior to entering water, including 253 ft. of wet gas zone and 238 ft. of oil zone. The gas-oil interface was found at 7,105 ft., 4,161 ft. below sea level; while the oil-water interface came in at 7,343 ft., or 4,399 ft. subbsea.

Hole completed drilling at 7,380 ft. was plugged back to 2,790 ft. and crew set 7-in. production casing down to 7,153 ft. Plug was drilled out and tubing was run to 7,280 ft. for production tests. Latest reported test was run for 23 hours, through chokes varying in size from 30/64 to 26/64-in. During that test period the well flowed 1,014 bbl. of 40.5°-gravity crude oil, indicating a restricted flow potential of 1,058 bbl. daily. Gas-oil ratio was approximately 850 cu. ft. per bbl.

CANADIAN SUCCESSFUL WILDCATS

Gulf-CPR 4, LSD 4, 3-46-28w4, TD 7,380 ft., IP 1,058 BOPD.
Mazal 1 Drumheller, LSD 12, 29-29-21w4, TD 5,580 ft., IP 1,220 BOPD.
Dome-J. V. 13-9 Consort, LSD 13, 9-37-6w4, TD 4,282 ft., capped gas well.
Anglo 1 Howie, LSD 4, 4-23-10w4, TD 3,937 ft., capped gas well.

CANADIAN WILDCAT FAILURES

Trans Era-Red Creek 1 Bonnie Glen, LSD 14, 13-47-27w4, TD 6,968 ft.
Merril-Calvin-Kenwell 7-10 Amerada, LSD 7, 10-49-16w4, TD 4,125 ft.
B. A. Gateway 9-3 Morningside, LSD 9, 3-42-25w4, TD 7,277 ft.
Socony-Tudor 1 CPR, LSD 4, 29-24-23w4, TD 8,505 ft.
Bailey-Selburn-Amerada 5-7 Mayton, LSD 5, 7-34-26w4, TD 8,200 ft.
Texaco G-2 Wizard Lake, LSD 4, 9-48-27w4, TD 6,888 ft.

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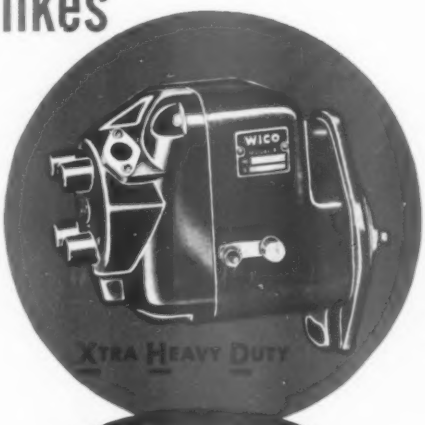

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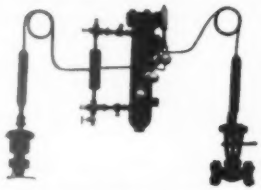

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Rocky Mountain

Another Mesaverde Strike Reported in Wyoming

DENVER. — Another apparent Mesaverde discovery has been made in southwestern Wyoming. The formation, not previously regarded as a major producing source north of the San Juan basin took the attention of operators in the region several weeks ago when Stanolind Oil & Gas Co. tested apparently commercial quantities of oil from the 1 Unit, SW NE SE 10-12n-103w, in the Middle Mountain area of Sweetwater County.

This week Mountain Fuel Supply Co. reported recovery of gas at the rate of 4,260,000 cu. ft. per day from 1 Trail Unit, NE NE SE 9-13n-100w, about 20 miles northeast of the Stanolind discovery. The well tested gas from basal Blair sand, the lowermost member of the Mesaverde at a depth of about 7,530 ft. Complete details of the test have not been released by Mountain Fuel Supply. Total depth of the wildcat was 7,731 ft. It was plugged back to 7,568 ft. Hydrofraced before the test. Mountain Fuel is continuing test at the apparent discovery. Stanolind is drilling below 8,000 ft. and will test deeper horizons before attempting completion of the Middle Mountain discovery.

Meanwhile, in Uinta County, Utah, Continental Oil Co. has set casing at 8,275 ft. in the 1 Chapita Wells, SE SE NW 16-9s-23e (SIM), and is preparing to core ahead. The wildcat made 700 ft. of 60°-gravity oil on test of the interval 8,282-96 ft. last week and unloaded water cushion and additional oil after 44 stands were clear of the hole. Tool was open 165 minutes on this test. Previous oil production in this basin has been from basal Green River formation. A success here coupled with other apparent successes mentioned above in southwestern Wyoming will intensify the exploration campaign in these areas. Leasing in the Green River basin of Wyoming has already topped previous highs with the announcement of Mesaverde shows there.

Northwest of the new Wyoming discovery Western Oil Refining Co. has diverted flow of gas with installation of casinghead at the 2 Government, NW NW SW 28-28n-113w, Sublette County. The well blew out a week ago from a depth of 984 ft. with a flow of gas estimated at 73,000,000 cu. ft. daily after reported measurements with impact valve. Mountain Fuel Supply Co. has set a rig on location at the well, and is lending assistance in bringing it under control. Reports indicate that there has been no appreciable drop in the rate of flow since the well came in out of control. Producing formation has not been identified. The well was staked as a pooler in North LaBarge field which produces oil from the Almy conglomerate.

Other Wyoming developments include a reported test of 56 bbl. of oil and 38 of water in 41 hours at the G. H. Vaughn Production Co.'s 1 Unit, SW NE NW 11-15n-91w, Carbon County. Production was from Tensleep from 10,230-42 and 10,244-50 ft. The operator will reperforate and continue testing on the well which is important as the first indication of commercial Tensleep production this far south in the state.

The Denver-Julesburg basin of Colorado and Nebraska led the region in new activity during the week, with 27 new locations of all kinds, including 14 wildcats. Colorado and Nebraska each had seven wildcat starts. The nucleus of Colorado new exploratory work is in Washington County, where Amerada Petroleum Corp. is testing an apparent discovery at 1 Sharp, NE SE SW 26-1s-54w.

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The wildcat is one of a series of stratigraphic tests being drilled through the county by Amerada, and by others taking farmouts from the company. It made 445 ft. of oil from a Dakota sand between 4,778-94 ft. Three locations on Amerada farmouts were announced by Anderson-Prichard Oil Co., and one by Hanco Oil & Gas Co., while Amerada announced the third in the current series. In Western Nebraska new wildcat starts were made in Cheyenne, Kimball and Deuel counties.

Williston basin activity for the week produced no new development of major importance. Current operations in the northeastern corner of the state where a trio of wildcats in Sheridan, Daniels, and eastern Roosevelt County are now approaching critical depths are being closely watched. Success in this untested area would be the first in an untested area of more than 10,000 sq. miles of eastern Montana.

In North Dakota, Lion Oil Co. has staked location for the third in a series on eastern Williston basin prospects at 1 Magnuson, C SE SW 2-163n-77w, in the Turtle Mountain area of Bottineau County. The company recently plugged the second in this series, 1 Huss, C NW NW 23-163n-75w, at 6,440 ft. Data on this test has not been released.

In Williams County, Champlin Tank Co. has abandoned the 1 Tank, C NE SE 7-156n-96w, west of the Beaver Lodge pool, with total depth at 12,204 ft. Extensive testing and coring in this wildcat made it one of the most expensive drilled in the basin, with reports from Bismarck placing its cost in excess of a million dollars.

Northwest of Tioga field, Pure Oil Co. is coring at 8,040 ft. in the 1 McGinnity, C NW NE 7-158n-95w, with top of Madison reported at 8,000 ft. This is Pure's first Nesson anticline operation.

WYOMING WILDCAT FAILURES

Big Horn County: Stanolind Oil & Gas Co. 1 J. A. Foreman, NE SW NW 2-56n-96w, dry, TD 3,170 ft. Madison 3,070 ft.

Natrona County: Zephyr Drilling Co. 1 Government, SE SE SE 23-34n-82w, dry, TD 2,2,416 ft. Chugwater 1,249 ft.

Washakie County: R. G. Parrent & Co. 1 Bonanza, NE NW NW 1-48n-91w, dry, TD 2,989 ft. Tensleep 2,947 ft.

Park County: J. S. Abercrombie 1 Otte, NE SE NE 29-57n-98w, dry, TD 6,942 ft. Madison 6,930 ft.

COLORADO WILDCAT FAILURES

Logan County: Big Six Drilling Co. 1 State, C SE SE 35-8n-51w, dry, TD 4,825 ft. "J" sand 4,746 ft.

C. U. Bay 1 Simms, SE NE NE 28-10n-53w, dry, TD 4,975 ft. "J" sand 4,924 ft.

British American Oil Producing Co. 1 Madden UPRR, SW SE SW 19-12n-52w, dry, TD 5,347 ft. "J" sand 5,240 ft.

Washington County: Amerada Petroleum Corp. 1 Strat Test, SW SW SW 6-1s-54w, dry, TD 5,156 ft. Cloverly 5,137 ft.

WESTERN NEBRASKA WILDCAT FAILURES

Box Butte County: Shell Oil Co. 1 Wildy, SE SE SE 1-28n-48w, dry, TD 4,418 ft. Granite 4,405 ft.

Cheyenne County: Perl Smith 2 Doran, NW SE NE 8-15n-49w, dry, TD 4,160 ft.

J. C. Wynne 1 Anderson, SE SW SE 34-15n-51w, dry, TD 5,443 ft.

Dundy County: Deep Rock Oil Corp. 1 Nichols "A," NE NE SW 6-3n-40w, dry, TD 5,459 ft. Reagan 5,412 ft.

Kimball County: James P. Sloss 1 State, SE SE SE 36-14n-55w, dry, TD 6,395 ft. Skull Creek 6,246 ft.

NORTHERN NEW MEXICO WILDCAT FAILURE

San Juan County: Southern Union 1 Navajo, SW NE NE 1-21n-14w, dry, TD 9,346 ft. Quartzite 8,760 ft.

MONTANA WILDCAT FAILURES

Chouteau County: Knees Producing Co. 1 Harris, NE NE SW 19-23n-3e, dry, TD 1,895 ft.

Phillips County: Williston Basin Exploration Co. 1 Thunderbird, C NW NW 4-23n-30e, dry, TD 4,292 ft. Madison 4,093 ft.

Pondera County: Sabo-Johnson 2 Gernact, NE NW SE 6-27n-1w, dry, TD 1,880 ft. Madison 1,876 ft.

NORTH DAKOTA WILDCAT FAILURE

Morton County: Hebron Brick Co. 1 fee, NE SW 5-140n-90w, dry, TD 2,900 ft.

South Louisiana

Lafourch Parish Wildcat Prepares to Complete

NEW ORLEANS.—The California Co. of New Orleans is preparing to complete its 1 W. A. Jones unit 1, Lafourch Parish wildcat, through perforations at 11,269-275 ft. Hole is bottomed at 12,102 ft. with 7-in. casing cemented at 11,400 ft. Prior to setting casing, operator ran log to total depth. Location is in Section 3-17s-22e.

Superior Oil Co. is reported to be plugging back on 2 Rockefeller, Cameron Parish wildcat, to test through perforations at 12,060-070 ft. Prior to plugging back, operator ran drill-stem test at 12,056-066 ft. With packer set at 12,014 ft., on a 5/8-in. by 22/64-in. chokes, well had a strong blow for 5 minutes,

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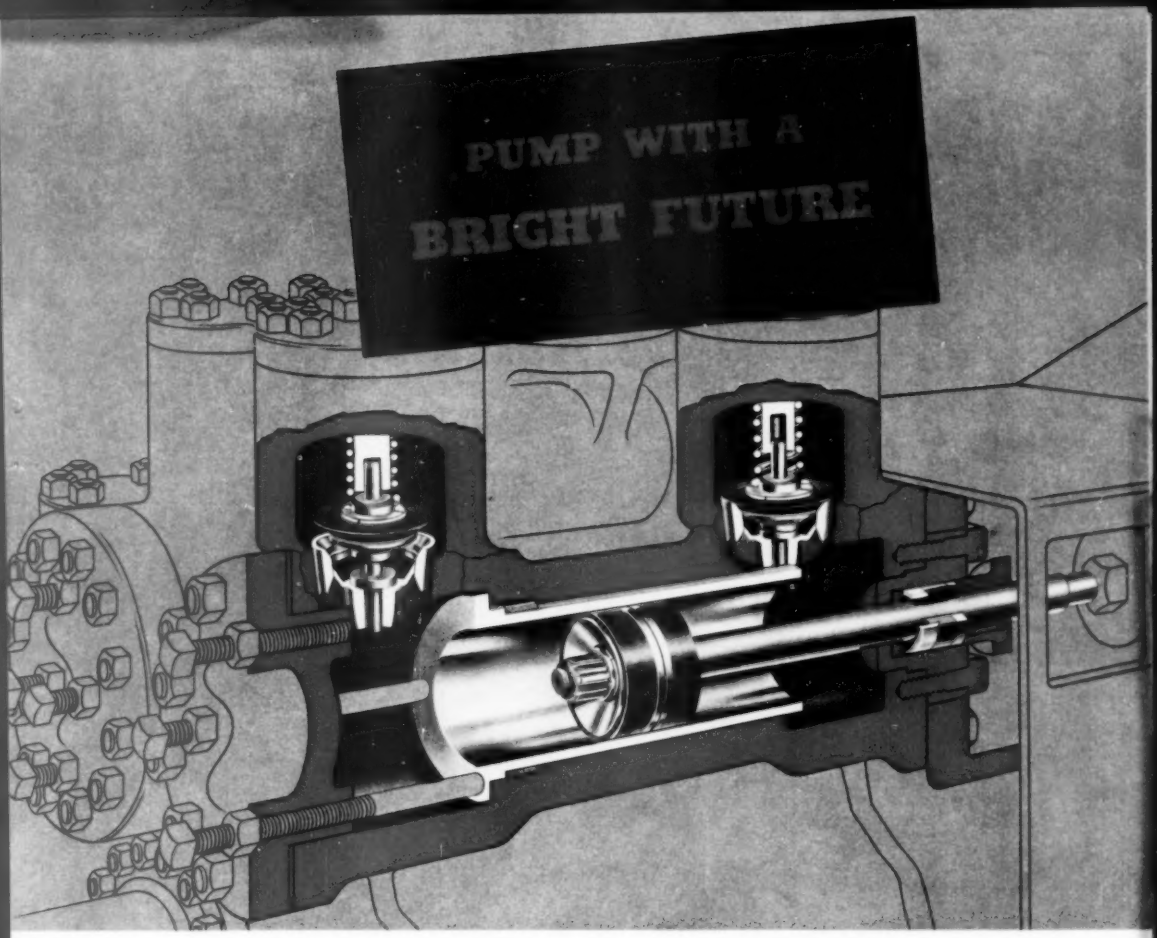

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then died. Bottom hole pressure was 3,600 psi. Well previously flowed 153 bbl. of 47.6°-gravity distillate plus 8,292,000 cu. ft. of gas daily through perforations from 12,154-162 ft. on a 6-hour gage. Location is in Section 3-16s-3w.

Union Sulphur & Oil Corp. is reported to be waiting on cement after setting 7-in. casing at total depth of 9,733 ft. at 1 Dewey M. Harmon et al, wildcat in Acadia Parish. Prior to running casing, operator ran log to total depth and took sidewall cores at 7,690-9,700 ft. Located approximately 2 miles west of Church Point venture is located in Section 51-7s-2e.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: W. O. Woodard, Trustee, 1 Long Bell Lumber Co., 33-5s-10w, dry, TD 10,783 ft.

Iberia Parish: Shell Oil Co. 1 St. Le. 1814, Vermilion Bay area, 18-17s-6e, dry, TD 16,000 ft.

Lafourche Parish: The California Co. 1 Calco-Superior Amelia Bailey, 61-17s-21e, dry, TD 12,039 ft.

Kansas

Scott County Wildcat Gets Marmaton Shows

ENCOURAGING oil showings have been encountered in another remotely located, far-western Kansas wildcat, Imperial Drilling Co. 1 See, SW NE NW 19-17s-31w, 8 miles northeast of Scott City, in northeastern Scott County. Nearest production is the small Keystone pool, located 7 miles to the south. Only other production in the county is in the old Shallow Water pool, in the extreme southern part, just north of the Finney County line. Scott County lies in the Hugoton embayment, off the northeast flank of the Hugoton gas area, where oil production so far has been found only in few, widely scattered small pools.

Showings in the Imperial wildcat were in the Marmaton (Pennsylvanian) lime, top of which tentatively has been called at 4,380 ft. A drill-stem test in the upper part, taking in an interval at 4,385-4,433 ft., got 365 ft. of gas, 30 ft. of heavily oil-cut mud, and 100 ft. of slightly gas-cut mud with 960 psi. bottom-hole pressure. No water was indicated. Showings have been passed up for the time being with hole being deepened to the Mississippian.

New oil discoveries also are reported at two wildcats in the east central part of Graham County, on the Central Kansas Uplift. One is by Jones, Shelburne & Farmer at 1 Michelson, NW NW SE 27-8s-22w, 4 miles southeast of Hill City. The other is by Keating Drilling Co. at its 1 Gosselin, 1½ miles to the northeast in the NW NW SE 24-8s-22w.

The Michelson well is a prospective producer in both the Lansing-Kansas City and Arbuckle zones. A drill-stem test at 3,481-3,514 ft. in the Lansing, topped at 3,422 ft., got 540 ft. of gas, 215 ft. of heavily oil and gas-cut mud, and 40 ft. of free oil with tester open 60 minutes. Arbuckle lime, topped at 3,759 ft. and tested at 3,763-75 ft., filled 178 ft. of oil and 90 ft. of heavily oil and gas-cut mud in the same time. The well has casing run to 3,762 ft. for completion.

In the Gosselin well, a 70-minute drill-stem test at 3,450-70 ft. in the Lansing, topped at 3,389 ft., got 150 ft. of heavily oil-cut mud and 85 ft. of muddy oil with 5 ft. of water. Hole is being deepened to the Arbuckle.

Location of the Michelson well is about 2 miles south of the Highland pool, while that of the Gosselin well is 3 miles east of the latter pool.

Phillips & Sanderson have run casing in their 1 Johnson, SW SW SW 5-16s-3w, southern Saline County wildcat, to test oil and gas showings found in the Maquoketa (upper Ordovician), topped at 3,435 ft. A 60 minute drill-stem in this possible pay zone at 3,436-43 ft. got 300 ft. of oil and gas-cut mud, 60-ft. of which was heavily cut.

KANSAS SUCCESSFUL WILDCATS

Ellis County: Imperial 1 Raynesford, SW SW NW 17-13s-20w, 132 bbl. of oil from Sooy 3,871-85 ft., TD 3,885 ft.

Pawnee County: Muskgrove 1 Phinney, SW SW NE 34-21s-16w, 3,000 bbl. of oil from Arbuckle 3,848-56 ft., TD 3,856 ft.

KANSAS WILDCAT FAILURES

Barber County: Great Lakes Carbon 1 Hoagland, SE SE NW 36-30s-15w, dry, TD 4,425 ft.

Butler County: Rex & Morris-NCRA 1 Phillips University, CEL NE SE 29-28s-5e, dry, TD 2,870 ft.

Ellis County: Petroleum, Inc., 1 Crissman, NW SE NE 34-12s-18w, dry, TD 3,677 ft.

Braden Drilling Co. 1 Spreen, SW SW NE 8-12s-10w, dry, TD 3,800 ft.

Graham County: Keating Drilling Co. 1 McKisson, NE NW SE 5-7s-21w, dry, TD 3,740 ft.

The Texas Co. 1 Fox, NE SE SW 29-8s-24w, dry, TD 4,400 ft.

Kingman County: Continental Oil Co. et al 1 Ralls, SW SW SW 11-28s-9w, dry, TD 4,555 ft.

Marion County: H. J. Uhl 1 Cole, SW SW SE 1-22s-3e, dry, TD 2,735 ft.

Osborne County: E. Cox & Cox 1 Meyer,

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Phillips County: Anderson-Prichard 1 Becker, NE NE SW 13-4s-19w, dry, TD 3,572 ft.

Pratt County: Anderson-Prichard 1 Long, SW SW NE 11-26s-15w, dry, TD 4,572 ft.

Rooks County: Lewis Drilling Co. 1 Cramer, NE NE SW 28-7s-17w, dry, TD 3,414 ft.

Jones-Shelburne & Farmer 1 Adams, NE NE SE 30-9s-17w, dry, TD 3,668 ft.

Rush County: Lindas Oil Co. 1 Herklotz, NW NW SW 5-16s-18w, dry, TD 3,617 ft.

Russell County: Bishop Oil Co. 1 Beller, CSL SW SE 16-12s-15w, dry, 3,617 ft., TD 3,205 ft.

Sheridan County: Anschutz 1 Wyant, NE NW NE 25-6s-30w, dry, TD 4,585 ft.

Harper-Turner 1 Senger, NE NE NW 34-8s-26w, dry, TD 4,438 ft.

Stafford County: Palmer Oil Co. 1 Fair, SW SW SW 5-22s-11w, dry, TD 3,783 ft.

Central Area

ILLINOIS

Trenton lime, which in Illinois has been found productive so far in only a relatively few, widely scattered small pools around the west and north side of the Illinois basin, is being tested by E. A. Obering at his 1 Kitowski, a wildcat in the NE SE NE 21-3s-2w, 7 miles southeast of Nashville, in southeastern Washington County, on the far west side of the basin.

Indications of Trenton production in this well were given in a prior drill-stem test of the prospective pay zone, logged at 3,900-34 ft., in which 205 ft. of clean oil and 200 ft. of muddy oil was recovered with tester open 2 hours. No water was indicated. During the test there was a substantial showing of gas, which was at the top within 67 minutes after the tester was opened. Present production tests are being started with casing run to 3,888 ft.

Nearest Trenton production is in the small Craig pool, located 12 miles to the southwest in northern Perry County. Nearest other production is from Benoist and Cypress sands in the Cordes and Dubois pools, more than 3 miles distant.

Ervin Drilling Co. 1 Prather, NE SE NE 32-2n-2w, a wildcat 2½ miles southeast of Carlyle, Clinton County, is being completed on the pump following swabbing tests in which it produced 17 bbl. of net oil and 4 bbl. of water per day from Benoist sand at 1,259-64 ft. Hole was plugged back to its present interval from 1,269 ft.

Production tests also are under way by D. B. Lesh Drilling Co. at its 1 John Jones, SE NW NE 12-4s-9e, which is opening a new producing area between the Centerville and Centerville East pools, in White County. Location is more than a mile from production

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INDIANA

Jack Ingles is opening a new Salem lime pool in southeastern Daviess County, where his 1 Edwards, NE NE SW 8-1n-5w, is being put on the pump estimated good for 50 bbl. of oil daily. The hole filled 200 ft. with oil after plug was drilled. Pay is in open hole at 1,058-71 ft. Location is more than 3 miles from nearest production, the Alfordsville pool, opened in July 1951. The latter pool also produces from Salem lime.

B. L. Fillingame 1 Bressett, NW NW NW 34-11n-8w, Vigo County wildcat, swabbed 4 bbl. of oil per hour and is being put on the pump for completion. Production is from Devonian lime, opposite which casing is perforated at 1,704-11 ft. Location is 8 miles southeast of Terre Haute and 2 miles from other production.

WESTERN KENTUCKY

Dobbs Drilling Co. and Fred W. Meyer, Jr., have a new Palestine sand producer at their 1 McNeely, a wildcat 5 miles northeast of Uniontown and 2 miles north of Morganfield, in northeastern Union County, near the Henderson county line. The well, ¾ mile from other production, mostly from Cypress sand, pumped 150 bbl. of oil per day (pump capacity). Pay is at 1,488-1,506 ft.

EASTERN KENTUCKY

In Elliott County, 20-T-76, Herchenroeder 1 M. S. Pennington wildcat on the Sandy Hook anticline is drilling at 1,050 ft. Well is located a short distance from other wells in the area which carried shows in the Weir and Corniferous formations.

A big well has been reported for Lee County at Price Fraley's 2 Pryse heirs in M-69. Geological markers are as follows: Big lime at 294 ft., Coffee shale 972 ft., and Corniferous lime at 995 ft. TD is logged at 1,156 ft. with two pays: 995-1,000 ft. and 1,026 to 1,052 ft. Initial potential was 100 bbl. per day.

MICHIGAN

Sun Oil Co. 1 Graham, NW SW NE 17-11n-11w, Ensley Township, Newaygo County, considered to be one of the most interesting wildcats being drilled in Michigan, was coring for Traverse objective below 2,209 ft. Well was reported to be higher structurally than correlating control points, and showed for about a half-million cubic feet of gas a day on drill-stem test in the Marshall. Top of Marshall was logged at 885 ft. Drill-stem test was run for 1 hour from 875-93 ft., and gas showed in 2 minutes. Maximum gage was reported at 516,000 cu. ft. of gas a day.

Panhandle Eastern Pipeline Co. tested a potential gas pay in the Salina at another

(Continued on page 366)

Steel Strike Causes Drop in Completions

by John C. McCaslin

THE oil industry is beginning to feel the pinch of tubular shortages as August completions in the United States fell 4 per cent below July. The month's completions fell 202 below July, 11 per cent below last August's record total of 4,430 wells. Total oil wells completed during the month showed a 9 per cent decline from July, while successful gas wells were up 9 per cent. Dry holes completed were down about 1 per cent from the preceding month.

Cumulative 1952 completions now stand at 31,287 wells, up 7 per cent over last year. Cumulative oil-well completions are up 7 per cent over last year, while gas wells and dry holes are both up, 10 and 8 per cent, respectively. Cumulative footage drilled so far this year in the country totals 128,881,759 ft., up 16 per cent over last year.

Operators need to drill but 14,504 more wells during the remaining months of this year to reach the 1952 total forecast by the Journal in the Midyear Number. Only 59,208,000 ft. of hole remain to be drilled in order to reach the forecasted year's total of 188,090,000 ft. This means an average of 3,626 wells and 14,802,000 ft. per month remain to be drilled.

August by areas . . . California wildcatting activity continued at what is probably a record high level but total drilling has fallen behind last year's pace. The decrease in development drilling under way for the past 3 months has been generally attributed to shortages of tubular goods. Until mid-August this year's activity had exceeded that of a year ago at all times.

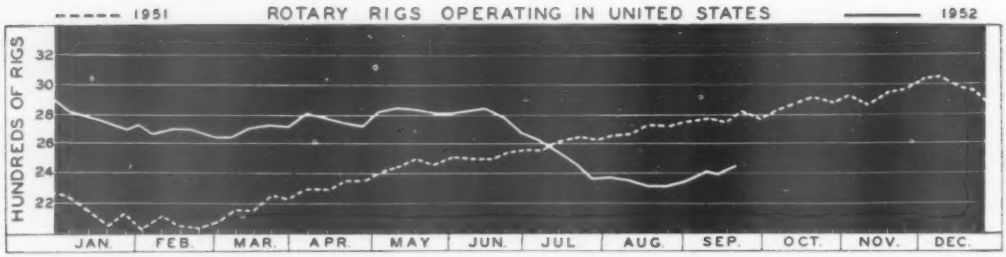
Other areas reporting declines in completions were the North Central and Eastern areas, and the Southwest. Texas completions dropped 34 per cent, the greatest decline percentagewise. Footage drilled in Texas showed a drop of 30 per cent from July.

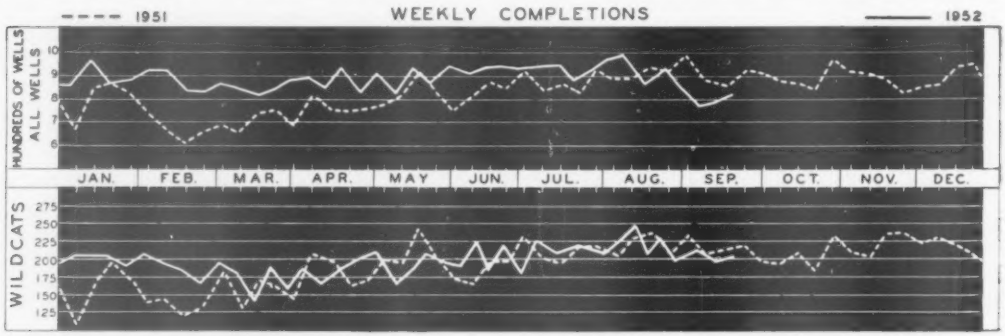
The Rocky Mountain area was up over July as were Kansas and Oklahoma, and the southern states of Louisiana and Arkansas. Oklahoma reported a substantial gain of 30 per cent over July in completions. North Dakota reported 16 completions in August, up 6 from July. At Beaver Louge and Tioga eight oil wells were completed successfully. Total footage drilled in the state was up 46 per cent. August was a record month this year for the country's newest oil-producing state in both completions and footage drilled. North Dakota wells produced approximately 200,000 bbl. of oil.

SUMMARY OF COMPLETIONS, AUGUST 1952

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Rigs and drilling
New York	68	34	0	34	68	0	0	0	0	0	98,400	75
Pennsylvania	179	83	18	78	172	7	0	0	0	0	360,839	175
West Virginia	48	8	30	10	21	26	1	0	0	0	141,991	220
Maryland	3	0	3	0	0	3	0	0	0	0	10,447	15
Ohio	93	35	19	39	44	48	1	0	0	0	204,706	165
Kentucky	104	32	19	53	68	36	0	0	0	0	218,483	157
Illinois	208	71	5	132	92	116	0	0	0	0	512,067	263
Indiana	119	38	1	80	101	18	0	0	0	0	203,582	160
Michigan	74	22	4	48	50	24	0	0	0	0	168,183	131
Kansas	396	189	28	179	41	342	13	0	0	0	1,368,798	367
Nebraska	53	14	2	37	5	30	18	0	0	0	234,919	37
Oklahoma	550	288	30	232	160	257	92	31	10	0	2,071,139	788
Texas	1,290	719	95	476	243	462	318	209	48	10	6,501,346	1,239
N. Central (Dist. 7-B & 9)	399	213	2	184	138	186	72	2	1	0	1,386,052	346
West (Dist. 7-C & 8)	379	290	3	86	24	98	145	91	14	7	2,324,343	338
Panhandle (Dist. 10)	74	21	32	21	15	56	0	2	1	0	223,548	104
East (Dist. 5 & 6)	81	41	5	35	7	38	28	6	1	1	407,523	76
Gulf Coast (Dist. 2 & 3)	205	99	23	83	16	45	34	87	21	2	1,412,195	211
Southwest (Dist. 1 & 4)	152	55	30	67	43	39	39	21	10	0	747,685	164
Louisiana	232	108	19	105	55	54	27	35	45	16	1,475,022	257
North	140	64	13	63	53	50	24	10	3	0	524,373	105
South	92	44	6	42	2	4	3	25	42	16	950,649	152
Arkansas	46	29	0	17	9	31	4	2	0	0	166,584	42
Mississippi	27	9	0	18	0	1	18	4	4	0	198,459	29
Ala.-Ga.-Fla.	3	2	0	3	0	0	5	0	0	0	31,397	5
Montana	45	21	2	22	16	19	8	2	0	0	162,261	101
Wyoming	56	30	3	23	11	16	20	9	0	0	275,116	152
Colorado	40	10	1	29	4	12	24	0	0	0	198,250	56
Utah	10	3	2	5	0	2	1	6	1	0	77,881	42
New Mexico	95	43	30	22	23	28	14	17	10	3	527,996	216
California	187	142	2	43	61	66	37	10	11	2	786,583	242
North Dakota	16	8	0	8	1	3	0	11	1	0	116,824	40
Miscellaneous	2	0	0	2	1	0	0	1	0	0	9,597	11
Total August 1952	3,946	†1,938	313	*1,695	1,246	1,601	601	337	130	31	16,120,870	‡4,985
Total July 1952	4,148	2,141	289	1,718	1,331	1,620	709	326	121	41	16,953,029	5,128
Total August 1951	4,430	2,286	320	1,824	1,483	1,826	752	245	99	25	17,061,800	5,623
Cumulative 1952	31,287	16,536	2,150	12,601	9,543	12,554	5,565	2,448	947	230	128,881,759	. . .
Cumulative 1951	28,986	15,415	1,951	11,620	9,631	12,157	4,708	1,638	721	131	111,124,213	. . .
Alberta, Canada:												
August 1952	152	85	12	55	26	75	47	4	0	0	620,691	. . .
July 1952	142	79	13	50	14	68	59	1	0	0	611,208	. . .
Cumulative 1952	1,039	606	82	351	137	420	461	17	4	0	4,525,793	. . .

*Incl. 142 service wells: N. Y. 34, Pa. 61, Ohio 3, Ill. 3, Mich. 15, Kans. 3, Okla. 21, N.C. Tex. 1, N. La. 1, †Incl. 32 condensate wells: Okla. 1, N.C. Tex. 1, W. Tex. 1, E. Tex. 4, Tex. Gulf Coast 11, S.W. Tex. 1, S. La. 13. Canada 2 (not incl.). ‡Incl. all wells rigged up and/or drilling at month end. §Incl. S. D. 2 dry wildcats, 9,597 ft. ¶Incl. S.D. 6, Ariz.-Idaho-Nev. 5.





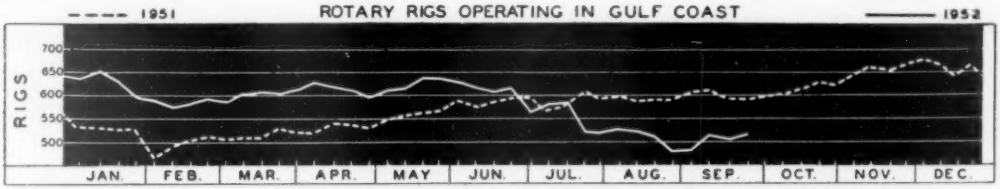
CURRENT STATISTICS

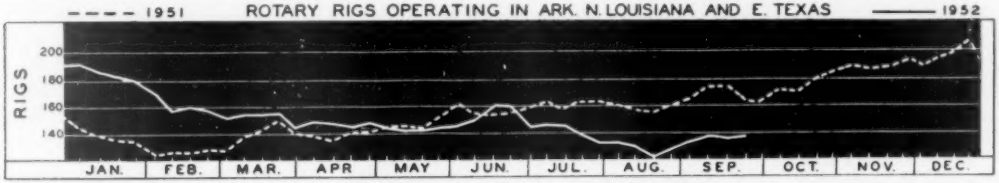
EXPLORATION

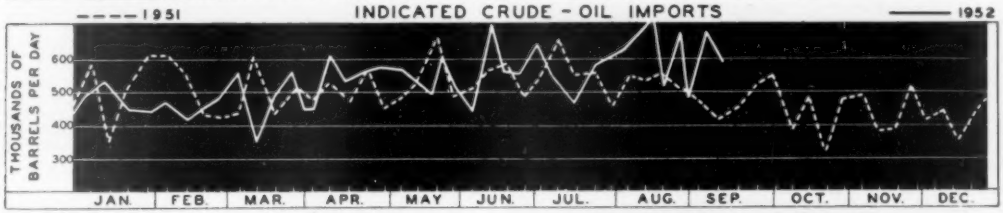
WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 20, 1952

	Total of all wells					Sept. 20		Wildcat completions and discoveries					Cumulative total, 1952				
	Comp.	Oil	Gas	Dry	Footage	1952	1951	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	17	8	0	*9	24,600	559	485	0	0	0	0	0	0	0	0	2	2
Pennsylvania	45	20	4	†21	90,200	1,423	1,229	0	0	0	0	0	0	0	0	2	2
West Virginia	10	1	7	2	28,910	452	425	0	0	1	0	1	0	0	3	5	8
Ohio	10	4	1	‡5	23,762	725	693	0	0	0	0	0	2	0	7	16	25
Indiana	21	7	0	14	41,512	890	928	1	0	0	2	3	26	0	2	252	280
Kentucky	22	6	6	10	50,959	931	878	0	0	0	4	4	18	0	1	187	206
Illinois	50	19	0	31	130,005	1,425	1,753	1	0	0	16	17	17	0	0	399	416
Michigan	13	3	2	8	34,988	518	571	0	0	0	5	5	21	0	4	173	198
Kansas	76	34	10	§32	264,271	3,382	3,198	2	0	0	18	20	77	0	10	562	649
Nebraska	10	3	0	7	52,487	215	161	0	0	0	5	5	8	0	2	116	126
Oklahoma	102	53	4	¶45	392,708	4,222	4,064	2	0	1	14	17	80	2	11	448	541
Texas	274	146	9	119	1,322,509	12,708	12,090	7	0	2	78	87	576	40	91	2,771	3,478
North Central (Dist. 7-B & 9)	89	35	1	53	330,737	3,992	3,663	3	0	0	39	42	321	2	24	1,151	1,498
West (Dist. 7-C & 8)	63	52	0	11	398,481	3,921	3,671	2	0	0	8	10	130	1	6	519	656
Panhandle (Dist. 10)	12	5	5	2	41,950	500	868	0	0	1	1	2	4	0	7	37	48
Eastern (Dist. 5 & 6)	7	5	0	2	33,451	678	534	0	0	0	2	2	15	4	2	166	187
Gulf Coast (Dist. 2 & 3)	52	24	2	26	326,444	1,884	1,661	1	0	0	11	12	58	23	23	395	499
Southwest (Dist. 1 & 4)	51	25	1	25	191,446	1,733	1,693	1	0	1	17	19	48	10	29	503	590
Louisiana	54	28	6	20	370,625	1,670	1,534	0	0	0	6	6	32	17	11	219	279
Northern	27	13	5	9	97,523	905	834	0	0	0	3	3	13	0	7	105	125
Southern	27	15	1	11	273,102	765	700	0	0	0	3	3	19	17	4	114	154
Arkansas	8	2	0	6	31,761	286	288	0	0	0	3	3	6	0	0	61	67
Mississippi	5	1	0	4	31,138	251	253	0	0	0	3	3	13	2	1	118	134
Southeastern States	1	0	0	1	7,271	47	40	0	0	0	1	1	3	0	1	26	30
Montana	6	1	0	5	14,333	223	159	0	0	0	3	3	5	0	1	53	59
Wyoming	15	8	0	7	77,836	496	515	0	0	0	4	4	18	0	3	91	112
Colorado-Utah	7	2	1	4	36,039	366	192	0	0	0	4	4	17	0	8	152	177
New Mexico	21	7	9	5	119,585	765	483	2	0	0	2	4	28	2	1	75	106
California	45	28	2	15	232,449	1,767	1,645	0	0	0	14	14	59	0	5	355	419
North Dakota	9	8	0	1	71,633	66	3	0	0	0	1	1	4	0	0	17	21
Miscellaneous (Md.)	1	0	1	0	3,332	53	76	0	0	1	0	1	0	0	20	20	40
Total United States	822	389	62	371	3,452,913	33,440	31,663	15	0	5	183	203	1,010	63	182	6,120	7,375
Total previous week	799	388	69	342	3,116,260			27	1	4	160	192	995	63	177	5,937	7,172
Total September 22, 1951	920	466	71	383	3,628,968			29	2	3	187	221	1,082	57	183	5,753	7,075

Service wells included: *9, †16, ‡2, §1, ¶3.



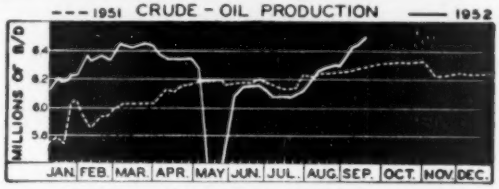


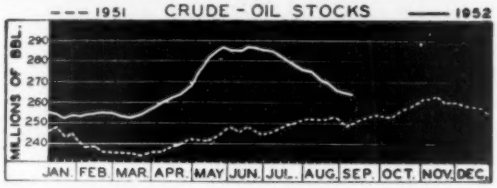


DAILY AVERAGE PRODUCTION FOR WEEK

	September 20, 1952			Sept. 13
	Crude oil	Lease condensate	Total	total
Alabama	2,900		2,900	2,850
Arkansas	74,850	600	75,450	75,700
California	985,300		985,300	987,400
Colorado	87,200		87,200	85,100
Eastern	58,000		58,000	57,000
Florida	1,575		1,575	1,425
Illinois	165,200		165,200	166,900
Indiana	34,200		34,200	31,900
Kansas	356,700		356,700	306,800
Kentucky	32,100		32,100	32,200
Louisiana	642,475	27,700	670,175	670,425
North	110,950	2,200	113,150	113,400
South	531,525	25,500	557,025	557,025
Michigan	33,100		33,100	37,600
Mississippi	92,250	3,500	95,750	96,150
Montana	25,500		25,500	25,500
Nebraska	8,100		8,100	7,900
New Mexico	164,250	400	164,650	164,750
Oklahoma	534,200		534,200	532,900
Texas	2,932,450	41,500	2,973,950	2,973,950
Dist. 1	35,100	150	35,250	35,250
Dist. 2	169,475	3,750	173,225	173,225
Dist. 3	478,400	23,500	501,900	501,900
Dist. 4	267,750	4,900	272,650	272,650
Dist. 5	50,000	200	50,200	50,200
Dist. 6	124,000	3,500	127,500	127,500
East Texas field	271,500		271,500	271,500
Dist. 7-B	104,750	50	104,800	104,800
Dist. 7-C	168,650	4,950	173,600	173,600
Dist. 8	997,475	200	997,675	997,675
Dist. 9	182,800	300	183,100	183,100
Dist. 10	82,550		82,550	82,550
Utah	5,000		5,000	4,700
Wyoming	190,000		190,000	188,000
North Dakota	7,800		7,800	7,000
Total U. S.	6,433,150	73,700	6,506,850	6,456,150
Change from previous week, up			50,700	
Canada	180,000		180,000	190,750
Total U. S. production January 1-September 20			1,618,506,075 bbl.	
Same period last year (crude plus cond.)			*1,611,071,100 bbl.	

*Includes 21,454,400 bbl. condensate.



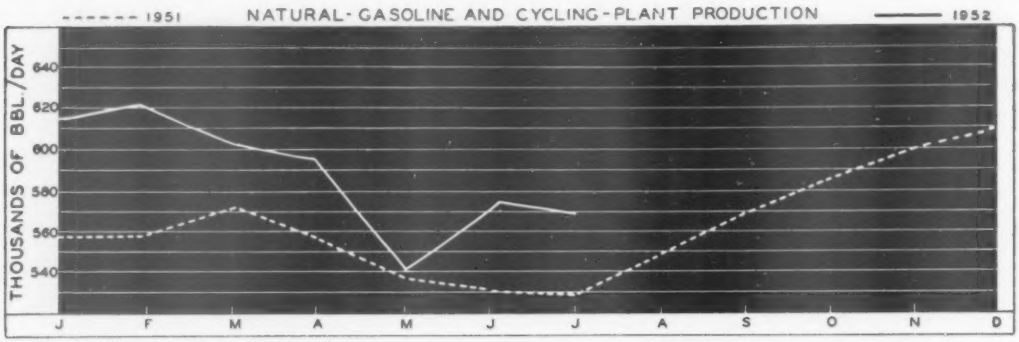


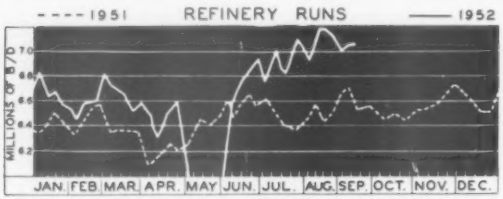
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

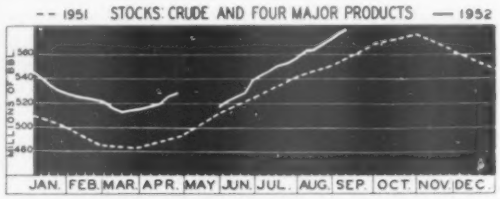
(Thousands of barrels)

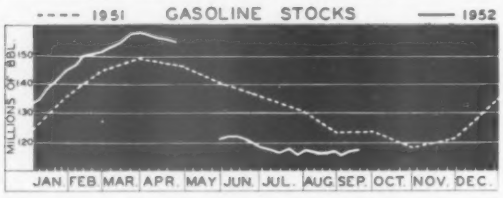
	Sept. 13, '52	Sept. 6, '52	Sept. 15, '51
Pennsylvania Grade	2,358	2,343	2,167
Other Appalachian	2,198	2,171	1,561
Illinois, Indiana, Michigan	12,378	12,999	12,388
Arkansas	2,975	3,185	2,713
Louisiana	15,837	15,816	14,633
North	2,288	2,476	2,685
Gulf	13,549	13,340	11,948
Mississippi	3,533	3,699	3,251
New Mexico	7,171	7,439	6,572
Oklahoma and Kansas	38,224	38,325	38,342
Texas	126,542	126,051	118,760
East Texas proper	13,080	13,326	(†)
West Texas	57,179	55,953	(†)
Texas Gulf	26,138	25,752	(†)
Other Texas	30,145	31,020	(†)
Rocky Mountain	14,950	14,772	13,110
California	31,113	31,420	30,050
Foreign	7,071	7,445	6,943
Total	264,350	265,665	250,490

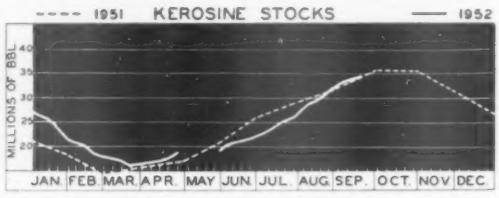
*Bureau of Mines. †Not comparable with current week.

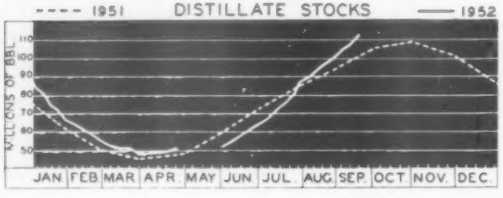


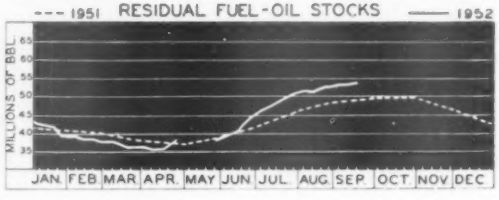










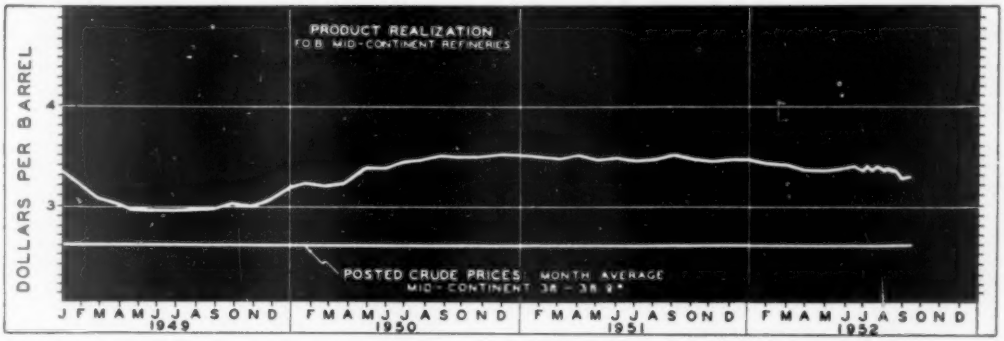


A.P.I. REFINERY REPORT, SEPTEMBER 20

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks†—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1951—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,087	460.1	50.0	243.1	222.6	29,876	15,136	41,277	12,275	1,057	422.7	46.5	260.7	220.4
Appalachian:														
District 1	117	47.7	4.3	19.3	14.7	3,444	634	1,549	777	106	48.1	5.1	14.7	9.3
District 2	73	40.4	2.4	14.7	16.7	1,780	295	605	457	68	35.4	3.1	9.9	13.4
Ind., Ill., Ky.	1,296	706.2	81.1	233.7	161.9	24,978	7,637	22,698	6,786	1,174	619.0	74.0	191.6	152.3
Okla., Kans., Mo.	563	326.3	14.6	136.3	55.3	10,988	2,093	13,277	1,550	518	296.1	17.4	123.8	59.0
Inland Texas	276	195.0	16.0	58.7	38.1	3,980	516	2,478	1,122	253	176.5	13.3	39.4	42.2
Texas Gulf Coast	1,702	801.1	144.5	407.3	261.6	16,930	4,234	12,186	8,382	1,580	726.7	121.3	322.3	248.9
La. Gulf Coast	533	264.6	51.3	135.7	56.0	6,292	2,710	4,106	2,032	513	247.9	59.7	121.9	59.2
N. La. and Ark.	88	34.1	6.6	21.3	5.0	2,595	585	1,089	192	75	30.9	6.9	15.5	7.0
Rocky Mountain:														
New Mexico	17	9.9		2.6	3.6	77		62	33	14	8.7	.3	1.5	3.8
Other Rocky Mtn.	242	117.0	7.6	43.9	44.3	2,971	481	2,192	1,284	219	99.7	6.9	40.7	42.0
California	1,066	423.3	11.3	151.7	338.1	14,404	359	10,953	18,594	981	415.2	9.4	139.8	370.6
Sept. 20, 1952	7,060	3,425.7	389.7	1,468.3	1,217.9	118,315	34,680	112,472	53,484	6,558	3,126.9	363.9	1,281.8	1,228.1
Sept. 13, 1952	7,059	3,447.4	358.9	1,484.0	1,217.6	117,296	33,724	108,641	53,274					
Sept. 22, 1951	6,550	3,107.4	341.9	1,363.9	1,194.9	123,120	35,888	102,334	48,724					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
4
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1949
F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.29 for week ended September 13, $3.28 for previous week, and $3.51 for September 1951. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of September 24, 1952. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅜-10½	12.125-12.75	10¾-11
Premium gasoline, 86-88 octane	11¾-11½	13.25-14.0	11¾-12
42-44 w.w. kerosine	8¾-9	10.4-10.65	9
No. 2 straw fuel oil	7⅜-8	9.4-9.65	8-8.25
No. 6 residual	$0.90-1.00	$2.10-2.25	$1.50-1.75

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6⅞	6⅜	6⅜
Grade 18-55	8.25	7.75	8.0

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	27-28
200 vis., No. 3 neutral, 0-10 pp.	14.5-15.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	5.5

ABOUT the only effect of the cooler weather on light and heavy-fuel markets of the country has been a slight increase in inquiries covering shipments during midwinter months. There has been very little improvement in current demand for either home-heating or industrial fuels.

Several major suppliers were reported to be in the Gulf Coast market for residual fuel to meet expected requirements for the December-March period. On the other hand, current demands have been below the level of total supply, and stocks have continued to rise. Scattered offerings are reported for New York Harbor at prices up to 10 cents under the normal posting for No. 6 fuel on the market.

Most of the movement of No. 2 fuel on the East Coast is still confined to purchases against contracts. Some material is reported to be available in New York Harbor at about 0.35 cent per gallon under ceilings for the area. This would mean 9.3 cents a gallon for No. 2 and 10.3 cents for kerosine. On the other hand, buyers seem to be holding out for 9.25 cents for No. 2. Also, there is no big rush to buy light fuel at this low price, since several cargoes are reported to be available on the Gulf Coast at prices that would deliver the No. 2 in New York Harbor at 9.25 cents.

The trend toward a soft distillate market on the East Coast results from crowded storage. Slow movement to secondary and consumer storage at a time when refinery production was very high brought rapid stock gains.

Refinery production of distillate fuels exceeded 10,000,000 bbl. per week for 14 of the weeks since the middle of June. Distillate production was above 10,000,000 bbl. for only 13 weeks during the past heating season. Daily average distillate production for the last 15 weeks has been exceeded in the past only by last February.

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Okla-homa, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93	....	....	
19-19.9	1.98	....	....	
20-20.9	2.03	$2.25	....	$2.12
21-21.9	2.07	2.27	....	2.14
22-22.9	2.12	2.29	....	2.16
23-23.9	2.18	2.31	....	2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico.

Last general price change represented a 50-cent increase, effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.	
Kettleman Hills, California*	$2.80
Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.25
Southwest Pennsylvania	3.82
West Virginia	3.76
Illinois Basin	2.77

*37°-37.9°

EQUIPMENT MEN . . . in the News

Dollinger Names Schiller Assistant Sales Manager

George A. Schiller has been named assistant sales manager of Dollinger Corp., Rochester, N. Y., manufacturers of industrial filters. He was formerly associated with Dustex Corp. Buffalo.

Schiller received a B.S. degree in mechanical engineering at University of Buffalo.

Anchor Names Shellhorn To Vice Presidency

F. A. SHELLHORN

W. A. (Bill) Baden, president of Anchor Petroleum Co., recently announced that Fred A. Shellhorn, in charge of transportation division of the firm since 1946, had been elected a vice president. Shellhorn will continue to be in charge of transportation.

In conjunction with Shellhorn's appointment Baden stated that Anchor's tank-car fleet has increased more than 33 per cent in the last year.

Shellhorn is chairman of transportation of the International Petroleum Exposition.

Chicago Bridge Elects Elsener to Vice Presidency

L. A. Elsener, manager of Chicago Bridge & Iron Co.'s San Francisco office, was elected a vice president of the company on September 3, 1952. The company's western operations include a new modern fabricating plant at Salt Lake City, a construction headquarters at Torrance, Calif., and contracting offices at San Francisco, Los Angeles, and Seattle.

Elsener was graduated with a B.S. degree in civil engineering from Purdue University in 1922. He has been associated with Chicago Bridge & Iron since June 1922 immediately following his graduation. He was a contracting engineer in the company's San Francisco office from 1923 to 1928, and has been manager of the office since that time.

Rector Transfers Johnson To South Texas Area

H. JOHNSON

J. L. Pinkard, sales manager of Rector Well Equipment Co., Inc., has announced the appointment of Howard Johnson as district representative for the company, with headquarters at Corpus Christi, Tex., to serve South Texas. Prior to his transfer to Corpus Christi, Johnson represented the company in the Alice, Tex., area.

Before associating with Rector, Johnson was with a major oil company, where he did field service work in Louisiana.

Thomas Is Named to Board Of B&W Tubular Division

William J. Thomas, general sales manager of tubular products division of The Babcock & Wilcox Co., has been named to the board of directors of the division, it has been announced by Luke E. Sawyer, vice president.

Thomas, a graduate of Carnegie Institute of Technology, has been associated with Babcock & Wilcox since 1932, and has been with the tubular products division since 1941.

Baroid's Floyd Palmer Is Transferred to Denver

F. E. PALMER

Floyd E. Palmer, assistant general sales manager of Baroid Sales Division, National Lead Co., has been transferred from the Houston headquarters to Denver for closer contact with the Rocky Mountain territory.

Palmer began his association with Baroid 20 years ago as a surface engineer. He was appointed superintendent in 1943, division sales manager in 1945, and in January 1950 he became assistant general sales manager.

Franklin Supply Co. Moves Dallas Office

Franklin Supply Co. has moved its Dallas office to 1428-30 Irwin Keasler Building, Dallas. L. H. Strouse, vice president, will make his headquarters in Dallas, and will reside at 6440 Brookshire Drive.

A. O. Smith Promotes Sullivan to New Post

T. A. Sullivan, supervisor of order service in the A. O. Smith Corp. Process Equipment Division for the past year, has been named product manager for the pressure vessels in the division. His appointment was announced by H. W. Brock, Process Equipment group manager.

At the same time Brock announced that R. T. Springate has joined the Process Equipment Division as superintendent of production control. Springate had been factory manager of the A. O. Smith truck-frame division. He is succeeded in his truck-frame post by T. E. Dillon, formerly manager of manufacturing for the passenger-frame plants under Peter Blake.

Gasche Is Promoted to New Post by Fred E. Cooper

At a recent meeting of the board of directors of Fred E. Cooper, Inc., Louis M. Gasche was elected to the office of vice president and assistant manager.

Gasche comes into his new position with many years of sales experience and full knowledge of the company's equipment and policies, having been in the employ of the company as a sales engineer since 1938, with the exception of a period spent in the Army during World War II.

Gasche holds a bachelor of science degree in mechanical engineering from Kansas State College.

Garth-Tex Tool Is Named OMECO Distributor

Garth-Tex Tool, Inc., of Beaumont, has been appointed distributor of OMECO products in Louisiana, Missis-

sippi, and the upper Gulf Coast of Texas, according to H. Vernon Smith, president of Oil Metering & Processing Equipment Corp.

The company will handle the complete line of OMECO products. Garth-Tex has offices in Houston, Beaumont, Lafayette, and Jennings, La.

Honeywell Adds 34 to Industrial Division Sales

Thirty-four sales engineers were recently added to the field sales force of Minneapolis - Honeywell Regulator Co.'s industrial division, it has been announced by O. B. Wilson, field sales manager. According to Wilson, the new appointees, all recent graduates from the company's industrial instrument-training school in Philadelphia, mark an over-all increase of 15 per cent in the field sales group this year.

The new salesmen who will be assigned to 27 cities in 22 different states are: Edward J. Reulbach, New York; Kenneth Ryan, Ralph J. Fittipaldi, and John P. Reynolds, East Orange, N. J.; James E. Vanderveld, Boston; Richard E. Howard, Hartford, Conn.; Joseph M. Heinold, and Richard L. Kanehl, Buffalo; Don P. McAdoo, Baltimore; Albert J. Walcek, Washington; Robert H. Branch, Roanoke; Wilbur A. Dixon, Atlanta; Stephen M. Kennedy, Jacksonville; James T. Emerson, Greenville; John H. Buri, John B. Freeman, and John Monsay, Philadelphia; Anthony J. Schneider, Cleveland.

Robert W. Meyer, Cincinnati; Thomas C. Farrell, Detroit; Warren G. Myers, Toledo; William B. Wells, Pittsburgh; Richard J. Bortoli, and William Lyford, Chicago; Robert Lederer, Davenport; Robert G. Steel, St. Louis; Vincent T. Coffman, Tulsa; Thomas W. Clark, Denver; Joe C. Graham, and Vernon S. Robyn, Seattle; Dwain M. Bates, Spokane; Richard C. Butler, San Francisco; Royce N. Crain, Los Angeles, and William A. Gill Indianapolis.

In addition recent transfers include: Denis J. McDowell, from Chicago to Milwaukee; John H. Morrison, Greenville to Knoxville; Lester E. Dotts, Philadelphia to East Orange; Edward Nikstenas, Birmingham to Nashville; William J. Kirby, Los Angeles supplies sales to instrument sales; William P. Ryan, East Orange supplies sales to control device sales; Alex L. Zsiray, New York supplies sales to control device sales; Charton S. Slenning, Portland Ore., service to industrial sales; Edward S. Crane, Buffalo to Philadelphia service; Thomas H. Jenkins, Chicago to Louisville, and Paul R. Sharadin, service to sales, El Paso.

Austin Named to Managerial Post by Engine Life

J. F. AUSTIN

J. F. Austin has been appointed manager of standard equipment sales, and also regional sales manager of Engine Life Products Corp., it has been announced by Winston R. Fuller, president. He will headquarter at Dallas and will be in charge of Midwest territory including Great Lakes region.

Austin was formerly associated with De Luxe Products Corp. of La Porte, Ind., having represented the firm for 11 years as southwest district sales manager as well as manager of its national oil field and industrial division for the past 2 years.

Engine Life filter manufacturing plant and executive offices are located at El Monte, Calif.

Weco Announces Sales Organization Changes

J. C. McCELVEY

John W. Gates, sales manager, Well Equipment Corp., has announced several recent changes in the firm's sales organization. J. C. McCelvey, formerly sales representative for the company in West Texas, has been appointed as assistant sales manager. J. R. (Rudy) Harrallson, who has just completed an extensive indoctrination program at the Weco plant in Houston, has been named as New Mexico-West Texas representative, replacing L. L. Durkin, who has

HARRALLSON

C. J. HOLCOMB

been transferred to Denver. C. J. (Chuck) Holcomb, who has recently been transferred to Weco's home office in Houston from Corpus Christi, has been made an industrial sales representative.

McCelvey's appointment gives Weco two assistant sales managers, necessitated by the addition of the Rocky Mountain area to Weco's sales territory. He has been with Weco since 1938 and is the firm's oldest sales representative in years of service.

Harrallson has previously been with Dunigan Tool & Supply Co. as West Texas sales and service representative.

In his new capacity, Holcomb will contact industrial firms, refineries, and chemical plants throughout the Gulf Coast and Mid-Continent areas of Weco.

Pipe Linings Appoints New Representative

A. J. GATES

Appointment of A. J. Gates as southwestern representative has been announced by Robert C. Sargent, executive vice president of Pipe Linings, Inc., Los Angeles service organization for the concrete lining of pipe lines in place.

Gates, whose headquarters will be maintained at Ruidoso, N. M., brings to Pipe Linings 25 years of experience in water supply and distribution work, both ground and surface. He formerly was assistant city engineer of Wichita Falls, Tex.; superintendent and engineer for the Wichita Falls water department; business manager for Midland, Tex., and also was connected with Joe E. Ward, Wichita Falls consulting engineer.

BS&B Appoints Williams Sales Training Director

BILL WILLIAMS

Henry A. Ruysser, Jr., vice president and general manager of sales, Black, Sivalls & Bryson, Inc., has announced the appointment of Bill Williams as director of sales training. Williams' appointment places him in charge of sales training for all sales divisions of the company. He will headquarter at the company's Kansas City offices.

Formerly associated with Buick Motor Division, General Motors Sales Corp., Williams was assistant zone manager at Kansas City. He attended University of Arizona, and received a law degree from Southern Methodist University.

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FOR SALE: 1500′ of 4½″ API. Full Hole Sonoscoped Drill Pipe. Wycoff - Williams Drilling Co. Grinnell, Kansas. Phone 57.

FOR SALE: Practically new Ruska Permeameters Cat. No. 1011. Hughes Engineering Company, 614 Westbrook Hotel, Fort Worth, Texas.

MODEL EK Waukeshaw Power Unit, Butane, Excellent running shape, $1,500.00 1879 Buda Diesel Power Unit, no clutch, $2,000.00 Rebuilt and runs good. Many others. Cummins Missouri Diesel Sales Corp., 3218 Lucas Ave., St. Louis 3, Mo. Phone—JEfferson 3244.

CARLOAD of Used Cast Iron Flat Belt Transmission Pulleys, sizes 12″ through 72″ diameter. Entire stock offered on close-out basis $75.00 per net ton FOB Monroe, Louisiana. M. KAPLAN & SON, Pipe—Structural Steel—Supplies. 9th & Adams Sts., Monroe, La.

FOR SALE: 5,000 Ft.—8⅝″ OD Used Standard Black Pipe, P.E., No. 2 Grade, at $1.98 per ft. F.O.B. Monroe, La. 2,500 Ft.—8⅝″ OD Used Standard Black Pipe, P. E., No. 3 Grade, at $1.50 per ft. F.O.B. Monroe, La. M. KAPLAN & SON. Pipe—Structural Steel—Plates—Supplies. 9th & Adams Sts., Monroe, La. Phone 5112.

900 MILES LINE PIPE

Selected, No. 1 grade. Thoroughly reconditioned for re-use.

400 Miles 8 and ⅝ in. O.D., 29 lb.
200 Miles 8 and ⅝ in. O.D., 24 lb.
200 Miles 6 and ⅝ in. O.D., 19 lb.
100 Miles 12 and ¾ in. O.D., 50 lb.

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NO PAD TICKETS NEEDED!

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Large Tonnages—First and Second Quarter. Shipment J-55 API Oilwell Casing Standard 5½″ and 7″

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New York 7, N. Y. Cable: "Artcoindus"

EQUIPMENT FOR SALE

FOR SALE: Failing "1500" Holemaster powered by Chrysler industrial power unit, mounted on 1942 GMC truck. Rig complete with mud pump, 1,000′ of "N" rods, drill collar and core barrel, slips, elevators, subs, etc. Equipment showing very little use. 1—1942 GMC water truck, A-1 condition. For inventory contact P. O. Box 409, Del Rio, Texas.

FOR SALE: 24L Bucyrus Spudder. Late model on rubber, with top to bottom tools, 6, 8, and 10″, 1800′ drilling and sand lines, dog house, light plant and etc. Also 1000′—7″ pipe. Donald Davis, Poneta, Indiana. Phone 972-2, Bluffton, Indiana.

FOR SALE: One #10 Unit Rig complete ready to drill powered with 2-D 13,000 Cat Engines compounded. 96′ Lee C. Moore Cantilever Derrick skid type, 7¼ Gardner Denver Pump. 4500 feet drill pipe. 2 dog houses. A. D. ALLISON & CO., INC., 715 Brown Building, Wichita 2, Kansas.

FOR SALE

186 miles of 6⅝″ O.D. x 18.97 lbs. Line Pipe, Single Random Length, Plain Ends beveled for welding and primed, now being taken up in Indiana and Illinois where line was operated under 850 lbs. working pressure. Material available for inspection. For further information please write or call: Commercial Metals Company, P. O. Box 1046, Dallas, Texas. HUnter 4651; Standard Pipe Supply Company, P. O. Box 243, Houston, Texas. CHarter 6976; Texas Pipe Supply Company, P. O. Box 1331, Houston, Texas. BLackstone 0101; Davidson Pipe Company, Inc., 2nd Avenue 50th-51st Streets, Brooklyn 32, New York, GEdney 9-6300.

EQUIPMENT FOR SALE

AIR COMPRESSORS: Davey Model 100 V.D., 160 cu. ft., International Diesel powered; $2,250.00. Chicago Pneumatic, 160 cu. ft., Hercules Gasoline powered; $1250.00. Located Tulsa. Midwestern Drillers, 628 Wright Bldg., Tulsa, Oklahoma. Phone 4-5263.

WELL drilling equipment, new or used Spudders, rotaries, core & shot hole drills, tools, pipe, bits, blocks, pump jacks, valves Everything for well drilling and service Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE in the Seminole area, a number of 250 bbl., 500 bbl., and 1,000 bbl. bolted steel tanks now erected on lease locations. List and prices upon application. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

Line Pipe Available Immediately

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1,000′ 8″ I.D. 28 lb. Good.
2,000′ 6¼″ beveled end. 40′ lengths; 13 lb.; very serviceable.
2,000′ 6¼″ casing, 13 lb.
15,000′ A-1 6″ O.D. beveled; 40′ lengths; clean; good.
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4,000′ 5⅜″ casing, good collars and threads; ready to run.
12,000′ 4″ O.D. steel pipe; excellent; beveled; clean; 35′ lengths.
1,000′ Very heavy 3″ I.D. casing.
2,000′ 2½″ plain ended line pipe, heavy and good
3,000′ 2″ No. 1 oil well tubing.
5,000′ No. 1, 2″ tubing; long collars.
1,500′ 1½″ tubing, clean and good.
2,500′ Good ¾″.

Also, field gas meters, pressure gauges, gate valves, etc., from 6″ down to ¾″; some cable tools. We are selling out our oil and gas business.

THE ALLEN GAS CORPORATION
Paola, Kansas. Phone 317

FOR SALE: 5,000 8⅝" O.D. Used 8-V recessed couplings off of 28.55# pipe that is clean, the dutchmans having been removed with a machine thread in perfect shape. Will sell any part for $1.50 each F.O.B. Shreveport, La. Contact A. A. Gilbert Pipe & Supply Co. P. O. Box 986 or Phone L. D. 97.

FOR SALE by Owner: 3500 feet 4½" OD seamless Youngstown drill pipe, 16.60#, Grade "E," with Hughes tool joints. Joints: API 4½" full-hole, 32 screw type, 80 flash-welded. Used but excellent condition shallow drilling. Also available Hughes 8" core barrel Type J complete and drill collar. Located Belhaven, North Carolina. 1095 National Press Building, Washington, D. C. Phone: NA-9150.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 182—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

1 Jumbo H Ft. Worth Spudder — steel mast #4600 Caterpillar Diesel motor on skids.

1 Super H Ft. Worth Spudder—steel mast E 60 Allis-Chalmers motor on skids.

1 No. 43 Star Spudder—E 60 Allis-Chalmers motor on skids.

All rigs are complete with all tools—dog houses—light plants—lines—belts—hand tools—etc.

COOPER, RICHART & FROST
P.O. Box #155, Garnett, Kansas

FOR SALE

DOUGLAS DC-3

(Converted C-47)

CUSTOM INTERIOR

PRIVATE COMPARTMENT
Divans — Swivel Chairs

TOTAL HOURS TO AUGUST 20, 1952

Airframe	3038
R/H Engine	415
L/H Engine	280

P&W R-1830-92 Engines—Hamilton Standard 6353A-18 Propellers

RADIO EQUIPMENT: 1 each: 51R-1 Omni-ILS Receiver, 51V-1 Glideslope Receiver, 51R-1 Communications Receiver, 17L-2 Transmitter, RA10DD Range Receiver with Loop, MN5313 Marker Receiver, AVQ-6 Radar Altimeter, 18S-3 Transceiver (Radio Telephone), 2-MN62A ADF's with MN60A Loops.

EQUIPMENT INCLUDES: C-2 Gyrosyn, CO_2 Warning Signal Unit, Cabin Radio & Paging System, A-3 Autopilot, Airstair Door.

BOX E-969
THE OIL AND GAS JOURNAL
Tulsa 1, Oklahoma

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

6,000' OF 4½" API. Full Hole Sonoscoped Drill Pipe. Also 4,000' of 3½" External EUE Drill Pipe. Milford Giffin, Tel. 477, Hoisington, Kansas.

FOR SALE: R. L. Cardwell with HXE Hercules Engine, 1st class condition, $6,500.00. Fred Cooper E 563 Winch Tractor, Single Drum mounted on six 75-inch Tires, 50 ft. mast, fine condition service 5,500 feet of 2½ inch upset tubing. Box 1215, Tulsa, Phone 5-8850.

FOR SALE: Fort Worth Spudder mounted on tandem with new UD9 International motor and complete equipment for shallow drilling including GMC 46 model 3-ton truck with float, GMC 39 model 1¾-ton truck, GMC 49 model ¾-ton pickup, Wilson 200 amp. portable welding machine, complete utility unit, 4,300 ft. ¾-in. drill line, 800 ft. 8-in. pipe. Chas. C. Reid, 1720 Keeler St., Wichita Falls, Texas, phone 6495 or 8001.

J55 CASING AVAILABLE FOR FOURTH QUARTER SHIPMENT

API specifications, mill certificate, Moody or equivalent inspection. Quantity available governed by your specifications.

JEFFERSON BAY EXPORT CO., INC.
60 East 42 St., New York 17. MU 2-6755

FOR SALE

In Southern Indiana

Pipe Line Gould Pumps

Snow and De La Vergne Engines

Also Air Compressors, Auxiliaries and Repair Parts

Good usable condition, only recently shut down.

SOHIO PIPE LINE CO.
R. L. CHARLES
1401 Midland Bldg., Cleveland 15, Ohio

OIL FIELD PIPE AVAILABLE

If you need Seamless Pipe for emergency requirements and the circumstances justify paying a higher price—such as obtaining producing leases because of shortage of pipe — or to fulfill urgent drilling obligations—or where you may have drilling sites with allowables that will more than pay for the extra cost of pipe in the four or five months' delay—We can offer in large quantities **6⅝" O.D. Seamless, .280 wall, approx. 20-lb., in Plain End** for immediate delivery from our yards in Houston. Seamless Pipe imported from Germany, all duty, inspection, etc., paid.
Lengths 35-45 ft., API made, monogrammed and inspected, which has yield of from 45,000 to 53,000 lbs. Although not guaranteed, as domestic API mills do not, should safely set to 4,000-foot depth more or less.
The price Plain End $285.00 ton (approximately $2.72 to $2.85 a foot).
API threads, couplings and testing to 3,000 lbs. at 40c per foot extra, by four plants in Houston.
If interested, wire or telephone Import Dept., Hercules Supply Co., P. O. Box 2595 or WO-8386, Houston.

FOR SALE or trade: 4500 ft. 8⅝" O.D., 32 lb. seamless, 8V thread casing. Phone 5-3545 or write Box 1581, Tulsa, Oklahoma.

FOR SALE: 1 Mack 1948 Model LJ 7-ton truck complete with Tulsa Model 84 winch, and Oilfield Ginpole Bed. Equipped with Al 11 X 22 rubber. F.O.B. Wichita Falls, Texas. $4500.00. Phone 2-5401 or write Jack Grace Drilling Company, Wichita Falls, Texas.

ONE Superior Twin Ninety Horse two cycle direct connected compressor with high and low cylinders with intercooler ready to run. Telephone 1000, Box 546, Bartlesville, Okla.

FOR SALE near Madison, Kansas, approximately 20,000' each of ⅝" and ¾" sucker rods, reclaimed from water flood project being developed and suitable for re-use. ⅝" rods 10c per foot and ¾" rods, 15c per foot. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE erected at our Stone Gasoline Plant, recently shut down near Burrton, Kansas, a number of sectional steel, corrugated iron buildings. List and prices available upon request. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

LATE Model GUMBO BUSTER, 21" Rotary Table. Excellent Condition. $2,750.00. Write or Wire: Blalack & Walter Drilling Company, P. O. Box 1509, Longview, Texas Phone 5744.

FOR SALE: Model R4 Wichtex draw works, 65' mast, Powered with PA 100 International motor, V-belt rotary drive, 17" oil bath, oil well rotary table, HB 50 Brewster block and hook, ⅞" drilling line, and guy lines, factory built steel sub-structure, folding walks and steps, 30' grooved kelly and kelly bushings, Wilson tongs, and 3½" mission slips. $10,000. GMC 2½ ton tandem truck, new tires and motor, oilfield bed and winch. $1800.00. 3000' 3½" modified drill pipe $1.25 per ft. Used 100 bbl. welded tank. $125.00. F. H. GRAVES DRILLING CO., Box 583, Ardmore, Oklahoma. Phone 4726.

FOR SALE in the Seminole area, one 20' x 40' x 10' Stefco sectional steel, corrugated iron building, erected, $1750.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: New 5,000 Bbl. Cap. API 10 Gauge Bolted Steel Tank. Ready to Ship Attractive Price. Lestan Corp., Rosemont, Penna.

FOR SALE at shut down Gasoline Plant in Kansas, 1 No. 5-WDH-5, BS&B Gas Dehydrator, complete. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: One 36-L Bucyrus-Erie drilling machine, complete with tools. Also 1,942 ft., new 7 inch, 17 lb., H-40, range 2, seamless casing and 2,409 ft. of new 3½ inch 4.60 lb., range 2, J-55, seamless regular tubing. Box E-812, The Oil and Gas Journal, Tulsa, Oklahoma.

FILTER, 48" diameter—50# design; Unused. Heresite lined—brass underdrain if desired. Immediate delivery. Pureflo, Box 105, Kearny, N. J.

COMPLETE Cardwell rotary rig: 6 x 16 pump; 87' Lee C. Moore mast; 3,000' 4½" drill pipe. Price $30,000. Ready to drill. Box G-100, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Well logging cable, 10,000 ft length, wire rope construction of galvanized steel wire with single central conductor. Unused, on Wood Reel. Georator Corporation, 1820 N. Nash St., Arlington, Va.

FOR SALE: 600 feet drill pipe 2⅞" O.D. x 20 feet 3⅜ O.D. Tool Joints—2⅜ IF Thread—A-1 Condition—$2.50 per foot. Circle Drilling Company, 220 Mayo Bldg., Telephone 2-9489, Tulsa, Oklahoma.

FOR SALE: 1—Bucyrus-Erie 28L Spudder No. 45408, with 36L Mast and Tools, stems for 13", 8" and 6" with fishing tools. All small tools and drilling lines. Dog house on rubber Tire Wagon. Everything complete and now drilling. Price $14,000.00. Approximately 280' of 10", 880' of 8" and 1500' of 6⅝" casing. Price $3,000.00 1—Model TD-6 International Dozer, 50" Tread, 14" shoes, Electric Lights and Starter, Bucyrus-Erie Hydraulic angle Blade, with Model "E" Carco Single Drum Winch. Used very little, good condition. Price $5,500.00. Call or write Harry J. Iles, Phone 284, St. Clairsville, Ohio.

EQUIPMENT FOR SALE

2400 FT. 4½" O.D. Seamless Range #2 Casing. Chase, Kansas. Will sell or trade. Jay Kornfeld, 1121 Union National Bank Building, Wichita, Kansas. Phones 42121-90996.

ZEOLITE (Water Softening). Carbonaceous type. Carload available at $10/cubic foot. Sample on request. Pureflo, Box 105, Kearny, N. J.

EQUIPMENT FOR SALE

FOR SALE: 94 Ft. Lee C. Moore Jackknife Cantilever Drilling Mast Complete with 4' x 38' Substructure for $9,750.00. Call 3-8988 or write 518 City National Building, Wichita Falls, Texas.

BUCYRUS ERIE 36-L, new 1950, Diesel motor, all tools 5 to 8", new lines, like new $22,500. Oil Producers, Inc., Murray Bldg., Grand Rapids, Michigan.

HELP WANTED

SALES Representative to sell proven paint, solvents, and chemical products already in major supply stores. Have no objection to representative handling non-competitive products. Liberal commission basis. Requires some knowledge of chemical engineering. Box E-988, The Oil and Gas Journal, Tulsa, Oklahoma.

CAT CRACKING OPERATORS Wanted: Men with experience in Thermal or Cat Cracking for positions of operator and assistants with Midwest refinery now installing new Cat Cracking Unit. Box E-980, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WANTED TO PURCHASE

Vacuum distillation Unit for distilling topped crude and obtain luboils, distillates and bitumen residue, of an approximate capacity of 1000 barrels feed stock (topped crude) per 24 hours including: pipe heater, fractionating tower, coolers, heat exchangers, pumps, vacuum equipment, control instruments, steel construction, steam superheater, etc. All in good condition to be delivered FOB or FAS Atlantic Port of U.S.A.

WRITE TO:

"ELBYN" LUBRICATED OIL REFINERY LTD.
MOSHATON — ATHENS
GREECE

EQUIPMENT WANTED

WE BUY well drilling equipment machines, cable tools, pipe, etc. Turn your surplus equipment into cash. Pressey & Son, Pueblo, Colorado.

WANTED: Three engine compound for Wilson Titan drawworks. Makin Drilling Company, Box 1628, Phone 3-3141, Hobbs, New Mexico.

WANTED: 1 — Boiler approx. 25,000 # Steam per hour 200 # WP. 1—Vacuum Jug approx. 8' dia. with trays. 1—Crude Oil Fractionator 8' dia. with 20 to 25 trays. Send price and full particulars to Northwestern Refining Co., St. Paul Park, Minnesota.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Greer Pipe & Supply Co., Box 1383, Tulsa Oklahoma.

WANTED: Weber and Fairbanks-Morse engines, 25 and 40 H.P. R. E. French, Gridley, Kans.

WANTED: Laboratory equipment, gum testing apparatus, air jet and ind period. Send full particulars to Northwestern Refining Co., St. Paul Park, Minnesota.

HELP WANTED

OIL Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

WANTED: Experienced seismic party chiefs, observers and computors for service in Central and South American countries. Must be prepared to fulfill two year contracts at appropriate salary. Assignments starting not later than December 1952. Write giving details of experience and education. Letters will be held confidential. Box E-928, The Oil and Gas Journal, Tulsa, Oklahoma.

OPERATORS for catalytic unit for midwestern area. Plant under construction and operators will be used as inspectors or other jobs during construction period. Write fully experience, education salary desired. Box E-979, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER for design and/or field installation of gas process equip. At least 2 years exp. in plant process or construction. Leading S. W. Manufacturer. Box E-992, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT Controller — Integrated oil Company in Mid-Continent area is seeking an experienced Assistant Controller. Position requires top-level man with experience in oil, systems and costs. Please submit resume which must give complete data on experience, salary requirements, and personal history, including education, background and associations. Box E-965, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

CHEMISTS for independent refinery for laboratory control and usual testing. Catalytic and poly experience helpful. Write fully education, experience, salary, desired. Our organization knows of this ad. Box E-978, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Graduate Petroleum Engineer, one or two years reservoir experience, to work for independent on secondary recovery programs. Give details of experience and salary expected in first letter. Box E-986, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF ENGINEER

Excellent opportunity in Los Angeles area for a young and progressive engineering executive with leading manufacturer of oil tools. Requires thorough and complete background in engineering and extensive experience in specialized field or oil tool products. Age limit 35-45. Salary commensurate with experience and ability. Please give full information, including age, education and experience. Box E-996, The Oil and Gas Journal, Tulsa, Oklahoma.

TOOLPUSHERS

Affiliates of Standard Oil Company (New Jersey) operating in Colombia and Peru offer exceptional career opportunities to men with potential to develop into Drilling Superintendents.

Candidates should be high school graduates, preferably with technical training, and have had actual experience pushing tools on heavy duty power rigs.

Write giving age, education, marital status, and details of experience.

Box 308-L
Radio City Station
New York 19, New York

OVERSEAS OPPORTUNITIES

Affiliates of
STANDARD OIL COMPANY (NEW JERSEY)
located in South America

NEED . . . .

EQUIPMENT INSPECTORS:

Engineering degree and several years metals inspection experience required. Will inspect refinery process equipment and request renewals where corrosion, failure, or defectiveness under safety codes makes necessary.

MECHANICAL ENGINEERS:

Qualified engineers needed experienced in: design of refinery and related equipment including utilities, materials listing and specification, and/or refinery maintenance engineering.

These are regular staff positions offering liberal salaries and benefit plans.

WRITE

giving complete address, age, marital status, education and details of previous experience.

Box 308-K, Radio City Station, New York 19, New York

HELP WANTED

INDUSTRIAL SALES REPRESENTATIVE
Integrated oil company has excellent opportunity for qualified applicant. Position requires background and knowledge of manufacture and sale of all industrial petroleum products including naphthas and solvents. Constant travel in the following states and Canada required: Wisconsin, Minnesota, Nebraska, Michigan and Illinois. College degree in Chemical Engineering necessary. All replies should contain work history, salary required, and recent photograph. Box E-990, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC PERSONNEL needed for United States and Canada by well known and expanding contract geophysical company. Address Box E-863, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: SEISMIC SUPERVISOR. Must have Party Chief experience, age 30 to 38, degree Geology or Geophysics. Replies will be kept strictly confidential. Call or write giving complete experience. A. E. "Sandy" McKay, Continental Geophysical Co., 602 Continental Life Building, office phone Fannin 9231, Residence phone Sunset 6053, Fort Worth, Texas.

PETROLEUM Industry needs experienced production engineers; field, well-sitting, and general geologists; refinery supts.; petroleum draftsmen. Write Professional Placement Service, 516 University Bldg., Denver, Colorado.

WANTED: Sales Engineers for large industrial instrument manufacturer. Prefer men with process experience in chemical and oil industries. Prefer Mechanical and Chemical Engineers. Fine opportunity for young engineers with sales aptitude to connect with one of the fastest growing industrial instrument companies in the United States. Must be graduate engineers or equivalent. Exceptional opportunities. Box G-101, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER for design and/or field installation of gas process equip. At least 3 years exp. in plant process or construction. Leading S. W. Manufacturer. Box E-993, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

OLDER Petroleum Engineer (Degree) wants job. Familiar with drilling, completions, production. Acidizing expert. Box E-967, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED land and contact man. Desires connection with oil company or drilling company seeking production. Box E-986, The Oil and Gas Journal, Tulsa, Oklahoma.

OUTSTANDING cutting oil, rust preventive and grease chemist desires position of Chemical Director with progressive company. Thirty million dollars worth of products formulated in past ten years. Fifteen years Chemical Director and Top Contact man. Box E-995, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS Engineer, 29. Five years refining experience including pilot plant, technical service and design, two years chemical plant experience. Desire job with a future. Gulf Coast area preferred. Box E-997, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING and Production Superintendent, 20 years Administrative and Operational Experience covering all phases of drilling and production of Oil and Gas wells in the Gulf Coast, South Texas and Ark-La-Tex Areas. Capable, Conscientious Worker, Married, 41 years of age, Character and Ability References Available. Presently Employed. Box E-998, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRE Sales Position in Oil Industry, preferably in West Texas area. 34 years old. College education. Previous experience: 2 years sales engineer, selling Heavy Industrial Equipment, 5 years on Drilling Rig. Now employed as Tool Pusher. Box E-970, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628. Ph. No. 3-3141, Hobbs, New Mexico.

SITUATIONS WANTED

CONSULTING ENGINEER. Available for fee or retainer representation in Rocky Mountains, Permian Basin, and Kansas. Evaluations and Supervision of Royalty or Operating Interests, Geological Reports and Deal Negotiations. References. Box E-968, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Mechanical Engineer, Age 36, desires to relocate. Eleven years varied experience in supervision of refinery maintenance, construction and inspection. Four years experience as safety engineer. Will consider foreign employment. Box E-977, The Oil and Gas Journal, Tulsa, Oklahoma.

THE RIGHT MAN for small independent operator. Applicant desires position to use all of experience. Capable of exploration and development geology, finding drilling prospects, supervision of drilling and production. Interested in land work although experience limited. Desire West Texas or Louisiana but experienced in Texas, New Mexico, Louisiana and Oklahoma. Age 35, presently employed as district geologist—a really good job, but desire opportunity of better salary or salary and interest. Excellent references and available on reasonable notice. Box E-976, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, age 31, graduate of L. S. U., with 3 years experience (mostly in Gulf Coast) desires position with progressive oil company preferably in Houston. Box E-983, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED deep water well and core driller worked Gulf coast, central, Rocky Mountains of United States, Canada and Venezuela at present employed as toolpusher 35 years old, married, best of reference want job with progressive company, go anywhere. Box G-102, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST 12 years major company diversified experience geology, scouting, leasing. Available. Will go anywhere. Box E-973, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer desires to supervise drilling, completions and production for independents in West Central Texas on retainer basis. Box E-946, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL Engineer, M.S.Ch.E. Univ. of Michigan, 24 years old, presently employed. Three years diversified experience in Pilot Plants, Process Design and Technical Service. Desires Sales or Field Engineering in Mid-Continent Area. Box E-921, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST — University of Wisconsin Graduate, Single, Age 29, wants job in lab and field work. Midwest preferred. Box E-975, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Geologist with Ph. D. interested in Domestic Oil Company assignment. Box E-991, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, recent graduate of Kansas State College, no experience. Prefer smaller company. Location no factor. Bob Bowersock, Box 185, Sedan, Kansas.

PRODUCTION Engineer; Five years experience in developing, producing, and evaluating oil properties with both a major and an independent producer. Desire responsible position with progressive operator on salary and for interest. Box G-103, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPE LINE Construction Superintendent. Presently employed. Want association with major pipe line construction or engineering firm. Twenty-six years experience with major operating companies. Will furnish references from reliable sources. Box E-971, The Oil and Gas Journal, Tulsa, Okla.

EXPERIENCED Rotary, Cable Tool and Production man would like to manage Oil Operators Drilling interest in Kansas. Can furnish reference. Oscar R. Gaultney, 2230 E. 20th. Phone 4-8532, Wichita 14, Kansas.

ATTENTION Sales Managers: Do you need an honest, experienced, hard working representative in North Central Texas area? Young man, 31½ years experience with extensive following among oil field producing and supply companies, desires to represent company needing Commission agent or salesman in this area. For interview, write, P. O. Box 1868, Wichita Falls, Tex.

SITUATIONS WANTED

LANDMAN: 33; experienced; Married; Law Degree; wants position in land department of Oil Company. Free to relocate. Write or phone: Lewis E. Brians, 1209 West Florida, Midland, Texas. Phone No. 2-3263.

PETROLEUM ENGINEER: Seven years drilling, producing and workover experience. Presently employed by major company. Desires responsible position with smaller company. Box E-982, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

WILLISTON BASIN ROYALTIES
Dealers in Montana royalties since 1921, we now specialize in royalties under major company leases in the Montana portion of the Williston Basin. For information on our method of operation, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

JACK EAGLE—Pay you immediately for your producing royalties and Overrides, absolutely no delay, send complete details. 706 City Nat'l Bldg., Okla. City, Okla. REgent 6-7027.

PRODUCTION
We Will Buy
PRODUCING landowners royalty and producing leases. Any amount, any area. Confidential information required and furnished. A 1 Bank Reference.
COMBEST ROYALTY COMPANY
825-826 Amarillo Bldg.
Amarillo, Texas

BUSINESS OPPORTUNITIES

WANTED: Well qualified oil operator regularly engaged in the oil and gas business to take over and develop offset acreage to good oil production in South Central Oklahoma. At least two sands to Approximately 2500 feet. Also 160 acre semi-proven lease at deeper depth. Address J. S. Graham, owner, Chickasha, Oklahoma. Telephone 2352.

WANTED—Producing properties, $500,000 to $5,000,000, from owner, banker, geologist, lawyer, broker. Confidential. P.O. Box 447 (GCJ) N.Y. 17, N.Y.

FOR SALE: Propane and butane business. Over one million gallon volume. Two bulk plants. Three tank trucks. Four retail outlets. Long term gas contract. Incorporated. Will sell capital stock or assets. Contact Elmer Jarvis at Wheaton, Missouri.

TRADE

TRADE: Model NJU, 6-ton, 4-wheel drive, MACK TRUCK, with 532 cu. in. engine and 15,000 lb. pull front winch—cost over $7000.00—unit driven only 16,000 miles. Will trade for late model 7¼ X 10 or 7¼ X 12 mud pump. R. F. HARE. 2018 W. T. Waggoner Bldg., Fort Worth 2, Texas.

RANCHES and FARM LANDS

RANCH FOR SALE
OVERLYING DESIRABLE OIL AND GAS RIGHTS
227,000 acres owned land with over 3,000 good quality Hereford cattle. Taylor grazing rights for 5,800 cattle. Summer and winter ranges. Ranch well watered from creeks and springs and provided with large reservoirs. Through drift fences this property controls almost exclusively over 600,000 acres well blocked. Light winter feeding, some years none. Now cuts about 3,000 tons hay and can be made to cut 10,000 or more tons or converted to grain or sugar beets. Ranch fully equipped with modern machinery. Buildings, old but serviceable and adequate. Price of ranch, cattle and equipment $1,400,000. This property located in northeastern Nevada owns, OIL, GAS AND MINERAL RIGHTS FOR 126,000 ACRES NOW BEING PROSPECTED BY MAJOR OIL COMPANIES. Full information to qualified buyers. Write HAYDEN HENDERSON, Licensed Broker, Elko, Nevada.

LEASE AND DRILLING BLOCKS

160 ACRES, Jack County, Texas. Offset acreage held by three major companies. Major company acreage taken after seismograph. Consideration: Ellenburger test plus small override. Possibility major company dry hole contributions. Paul Fleming, 1502 Fillmore, Wichita Falls, Texas.

ATTENTION
OIL MEN AND INVESTORS

Two thousand acres proven and semi-proven in Oklahoma and Kansas. Some has oil production on three sides. Fifteen thousand acres with oil and gas shows in New Mexico. Major interests for drilling and equipping $20,000 minimum. Defnitely not a promotion scheme. References available. Consult your accountant for tax advantages. Address: 11451 Berwick Street, West Los Angeles 49, Calif.

1246-ACRE drilling block western Runnels County, Texas. New 5 to 10 year leases. $20.00 per acre and 1/16 overide. Write 802 McBurnett Bldg., San Angelo, Texas.

FOR SALE: Production on three stripper leases with proven offsets in Hughes Co. 38 wells 5 years old fully equipped. Box E-974, The Oil and Gas Journal, Tulsa, Oklahoma.

700 FT. OHIO Oil Leases, 15 wells 110A. up. Low cost water input wells raises oil. Easy terms. E. N. Rehler, Allegany, N. Y.

POTENTIAL Gas Lands for lease; several producing wells in territory; three gas lines through territory making ready market. For information, write Critchett & Woods Lumber Co., Inc., Olla, Louisiana.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver Colorado.

FOR LEASE: The owners of the land and/or the mineral rights on 75,000 acres in Northeastern Louisiana would like to secure proposals for exploration and development on large or small acreages. One producer on the tract. Box E-864, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

LEGAL

20,529.11 ACRES of Tribal and 57.91 ACRES of restricted Alotted Indian lands located within the jurisdiction of the Uintah and Ouray Indian Reservation. Townships 14 and 15 South, Ranges 19 and 20 East, Salt Lake Base Meridian, in Uintah County, State of Utah, are being adverised for oil and gas lease sale, bids on which will be opened 2:00 P.M., September 30, 1952, at the office of Harry W. Gilmore, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from the office of the Regional Oil and Gas Supervisor, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, Washington 25, D. C. Notice is hereby given that seven parcels of land in T. 57 N., Rs. 98 and 99 W., 6th P. M., Wyoming, containing approximately 1076 acres, within the known geologic structure of the Little Polecat field, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 p.m., Eastern Standard Time, October 8, 1952, when bids will be opened. One hundred sixty acres of the lands offered are in a reclamation withdrawal, and a special reclamation stipulation will be inserted in any lease issued for these lands. The details of the lease offering, a copy of the reclamation stipulation, and how and where to file bids may be obtained by addressing an inquiry to the Manager of the Land and Survey Office, Cheyenne, Wyoming, or to this office. Marion Clawson, Director.

Central Area

(Continued from page 354)

St. Clair County wildcat, but well was scheduled to be deepened further in this section as soon as "junk" was cleaned from the hole at about 2,415 ft.

ILLINOIS SUCCESSFUL WILDCAT

Richland County: Murvin & Steber 2 Wheeler, NE NE NE 24-4n-9e, IP 14 bbl., Waltersburg 2,173-79 ft., TD 2,598 ft. (opens new pay zone).

ILLINOIS WILDCAT FAILURES

Clinton County: Al Schiermann 1 Suhl, NE NW NW 32-1n-3w, dry, TD 1,334 ft.
Coles County: R. A. Brown 1 Smith, SE SW SE 26-14n-10e, dry, TD 411 ft.
Edwards County: Calvert Drilling, Inc., and W. Duncan 1 Leigh, SW NW SW 36-1n-10e, dry, TD 3,364 ft.
Gallatin County: Calvert Drilling, Inc., 1 Blazer, SE NE NW 19-7s-9e, dry, TD 2,898 ft.
Hamilton County: Joe Reznik 1 Nance, NE SE NE 4-4s-5e, dry, TD 3,555 ft.
Ashland Oil & Refining Co. et al 1 B. K. Leach et al, NE NE SW 1-4s-6e, dry, TD 3,480 ft.
F. W. Young 1 Leslie, NW NW NW 25-5s-5e, dry, TD 3,400 ft.
Lawrence County: Olds Oil Co. 1 Schrader, SW SW NE 25-2n-13w, dry, TD 2,583 ft.
Montgomery County: Superior Oil Co. 1 Singler, SE SE NW 3-8n-2w, dry, TD 3,246 ft.
Superior Oil Co. 1 Fleming, SW SE NW 12-8n-2w, dry, TD 2,699 ft.
Superior Oil Co. 1 Bost, NE SW SE 22-8n-2w, dry, TD 2,565 ft.
Superior Oil Co. 1 Lanigan, NW NW SE 17-8n-3w, dry, TD 2,125 ft.
Perry County: Kingwood Oil Co. 1 Guenther, SW SW NE 24-4s-4w, dry, TD 2,801 ft.
Richland County: Sam Tipps 1 Fee, SW NE SW 8-3n-10e, dry, TD 3,190 ft.
Saline County: Boling - LeVine - Yabrove 1 Massey, SE SE NW 35-7s-6e, dry, TD 3,128 ft.
White County: W. L. Griffith 1 Pfister, NW NE SW 27-4s-9e, dry, TD 3,365 ft.

MICHIGAN WILDCAT FAILURES

Gratiot County, Hamilton Township: R. L. Oil Co. 1 Mills, NE NE NE 32-10n-1w, Dundee 2,995 ft., dry, TD 3,043 ft.
Muskegon County, Holton Township: F. W. Kehlet 1 Pederson, SW NW NW 11-12n-15w, Traverse, 2,048 ft., dry, TD 2,051 ft.
Oceana County, Ferry Township: Ford Oil Co. 1 Slocum, SE NE SE 11-14n-16w, Traverse 2,153 ft., dry, TD 2,157 ft.
Osceola County, Richmond Township: Paul E. Cholette, Trustee 1 Franke, NW SE SW 18-17n-10w, Dundee 3,572 ft., dry, TD 3,730 ft.
Sherman Township: Mogul Oil Co. 1 Keller et al, NW NE SE 7-20n-9w, Dundee 3,912 ft., dry, TD 4,007 ft.

WESTERN KENTUCKY WILDCAT FAILURES

Daviess County: Eakle & Holder 1 Tyler, E½ SW SE SE 5-O-27, dry, TD 2,319 ft.
McLean County: Sanders & Fye 1 Knight, W½ SE SW SE 11-N-27, dry, TD 2,159 ft.
Muhlenberg County: Basin Drilling Co. 1 Ford, SW NE NE NW 24-I-28, dry, TD 1,986 ft.
Union County: George Hoffman and Basin Drilling Co. 1 Martin, NW NW SW NW 11-O-21, dry, TD 2,759 ft.

INDIANA SUCCESSFUL WILDCAT

Posey County: Slagter Producing Co. 1 Schultz, SW SW NW 28-6s-14w, IP 45 bbl., Tar Springs 2,134-37 ft. and Cypress 2,480-90 ft. and 2,494-97 ft., TD 2,940 ft. (extends Welborn pool).

INDIANA WILDCAT FAILURES

Pike County: A. S. Reed 1 Thomas, SW SW SW 11-1s-8w, dry, TD 1,477 ft.
Posey County: Slagter Producing Co. 1 Goldman, SE NW NE 9-8s-14w, dry, TD 2,725 ft.

Permian Basin

(Continued from page 347)

discovery, which flowed 442 bbl. of 48°-gravity oil per day. Testing continues.

TEXAS PANHANDLE (DISTRICT 10) SUCCESSFUL WILDCAT

Sherman County: Shamrock Oil & Gas Corp. 1 Amend, 2-3-GH&H, 8 miles N, 10½ miles E Sunray, TD 6,541 ft., elev. 3,377 ft., gas pay 3,070-3,170 ft., IP 360,000 cu. ft. gas, RP 419 psi.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURE

Hartley County: Bridwell Oil Co. 1-A Houghton, 202-14-SCL, 20 miles W Channing, dry, TD 4,454 ft., elev. 3,931 ft., dolomite 3,184 ft., granite wash 3,612 ft., limestone 3,800 ft., pre-Cambrian 4,448 ft.

SOUTHEAST NEW MEXICO

The Texas Co. 1-BA State, west offset to East Cap Rock-Devonian field, was completed after testing perforations in the Devonian at 10,000-36 and 10,053-84 ft. Following mud-acid treatment, the well kicked off and flowed 215 bbl. of new oil in 7 hours through 28/64-in. choke, with no formation water. On potential the well gaged 277 bbl. of oil through the same size choke in 7 hours, and rated a daily potential of 950 bbl.

Shell Oil Co. 1-CA State, Lea County wildcat in 23-1s-36e, developed 6,450 ft. of oil and gas-cut mud on a 20-minute test at 10,311-30 ft.

Gulf Oil Corp. 1 Federal-General American Oil Co., deep test in the shallow Grayburg-Jackson field, was drilling below 8,964 ft.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCATS

Eddy County: Hanson & Yates 1 Cordie King, 22-23s-26e, TD 1,881 ft., elev. 3,324 ft., Delaware sand 1,861 ft., pay 1,875 ft., IP pumped 58 bbl. oil.
Buck Jones Drilling Co. 1 V. L. Gates, 29-26s-27e, TD 883 ft., elev. 3,199 ft., Castile pay 879 ft., IP pumped 20 bbl 22°-gravity oil.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Lea County: DeKalb Agricultural Association 1-A State, 26-11s-32e, dry, TD 10,713 ft., elev. 4,364 ft., Wolfcamp 8,290 ft., Mississippian 10,570 ft.

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